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October 11, 2010

Ms. Kathleen Harder
Central Valley Regional Water Quality Control Board
11020 Sun Center Drive, Suite 200
Rancho Cordova, CA 95670

Subject: Sacramento Regional County Sanitation District Comments and Evidence Regarding Tentative NPDES Permit, Time Schedule Order, and Permitting Options Circulated on September 3, 2010

Dear Ms. Harder:

Sacramento Regional County Sanitation District (District) hereby provides comments and evidence concerning the renewal of Waste Discharge Requirements (NPDES No. CA0077682) (Tentative Permit) and the tentative Time Schedule Order (TSO) for the Sacramento Regional Wastewater Treatment Plant (SRWTP), and the associated Tentative NPDES Permitting Options (Tentative Permit Options). The Central Valley Regional Water Quality Control Board (Regional Board) staff released the Tentative Permit, TSO, and Tentative Permitting Options on September 3, 2010. This letter, and materials transmitted with this letter, address those proposals and related issues. The District has, of course, provided Regional Board staff with considerable material and information previously; this letter and enclosures are supplemental to all the District's prior submittals.

The Tentative Permit properly identifies the beneficial uses of the Sacramento River and Delta, and their regional and statewide importance. The District has, since its formation by the state legislature in 1973 and commissioning of the SRWTP in 1983 accomplishing regionalization of wastewater treatment and disposal, provided safe collection, treatment, and discharge of wastewater from the Sacramento region in order to serve the region's citizens and protect the beneficial uses of the Sacramento River and Delta. The District has an exemplary record of compliance with the requirements imposed by the Regional Board, and has been a leader in promoting and funding efforts to understand and address water quality issues in the Sacramento River watershed based on monitoring, research, sound science, and collaboration. The District developed sophisticated technical tools that have undergone extensive peer review for use by the Regional Board in developing a new permit. Through its own investigation, the District identified the need to limit discharge of oxygen-

demanding substances including ammonia, in order to ensure that dissolved oxygen objectives are met.

Unfortunately, the Tentative Permit appears to be an attempt to justify a predetermined outcome to impose approximately $2 billion in new capital costs (as well as greatly increased operation and maintenance costs) on the local citizenry and economy, without meaningful benefit to the environment. In fact, such expenditure would not be sufficient to meet some of the unprecedented Tentative Permit requirements. The District strongly objects to many of the Tentative Permit provisions, as further detailed in these comments.

Respectfully, the District submits that the Regional Board staff has proposed a permit that appears in many instances to find its justification in talking points and political messaging of some interests—primarily water export interests — who have sought to disparage the District and obscure rational discussion and sound scientific processes. As a result of this policy choice, the proposed requirements in the Tentative Permit are not supported by a logic that is technically sound. In some cases, the scientific logic and environmental benefit are not discernible at all. While there are various legal issues relevant to the Tentative Permit and these comments, a principle applicable to all that follows is that the Regional Board "must set forth findings to bridge the analytic gap between the raw evidence and ultimate decision or order." (*Topanga Assn. for a Scenic Community v. County of Los Angeles* (1974) 11 Cal.3d 506, 515; see also *In the Matter of the Petition of City and County of San Francisco*, Order No. WQ 95-4, at pp. 23-24.) The Tentative Permit fails this test, and instead proposes treatment for treatment's sake. The press release that accompanied the issuance of the Tentative Permit is good evidence of this point, and close scrutiny of the Tentative Permit itself provides repeated examples.

In the comments following and other materials, the District addresses the stated rationale for various Tentative Permit terms. As a general comment, however, the District emphasizes that the proposed use of the "best practicable treatment and control" (BPTC) concept, from the State's Policy With Respect to Maintaining High Quality of Waters (Resolution No. 68-16), typifies the outcome-oriented approach contained in the Tentative Permit. To our knowledge, this policy, adopted in 1968, has never been used in this fashion in the renewal of a permit for an existing permitted municipal discharge, or interpreted or applied in this manner. It appears that BPTC arguments are used to dictate an outcome because the logic underlying certain proposed water quality-based effluent limitations, using applicable standards and regulatory requirements, is weak. Here, to an especial degree, the Tentative Permit echoes the rhetoric that fuels the policy pressure that has been directed toward the Regional Board to impose new and onerous requirements.

For example, one theme of that Tentative Permit's arguments is that, because some other municipal dischargers employ certain treatment technology, the District should too. A parallel theme is that because residents of some other municipalities currently pay more for wastewater treatment and disposal than those in the District service area, there should be no hesitation about a dramatic increase in the economic burdens imposed on citizens and businesses in the Sacramento region. In addition to certain errors in the Tentative Permit related to these issues that are discussed later, these arguments in the Tentative Permit are not intellectually sound.

In this regard, the Tentative Permit carefully selects certain municipalities and describes expensive treatment technologies that have been required of those agencies. While there are inaccuracies in this

information, Regional Board staff know well that the great majority of these agencies are dischargers to effluent dominated waters (EDWs), and not at all similarly situated to the District. (The others also discharge under vastly different circumstances than the District's discharge to the Sacramento River at Freeport.) Without doubt, the Regional Board has imposed costly requirements on EDW dischargers. Ironically, this has long been recognized as a problem, or set of problems, with the regulatory system as applied to EDWs (such as inappropriate designation of beneficial uses, lack of flexibility in the State Implementation Plan, or other regulatory requirements). Indeed, both the State Water Resources Control Board (State Board) and Regional Board have signaled, over and again, that they would address the issues unique to EDWs because the Boards know that unreasonable permit requirements will otherwise apply. However, the State and Regional Boards have failed to address this issue. Here, the Tentative Permit instead proposes as a solution that the Regional Board pretend that the District is an EDW discharger. This is not rational. The Tentative Permit is extraordinarily misleading by its failure to address why certain other permits include the requirements that drive the permittees to employ certain treatment technologies. We believe the technology-based and water quality-based permitting approach to the District should be the same as it is for other dischargers, and applicable standards and the law should guide the outcome. We do not believe the outcome must be the same for an ocean discharger as for a discharger to the Delta. Nor do we believe the outcome for the District must be the same as a given EDW discharger.

The discussion above relates, of course, to the subject of dilution. The District has been and will be chastised for "using the Sacramento River to dilute its pollution." For the record, urban Sacramento is located adjacent to the Sacramento River and has been for generations. There is a demand for wastewater utility service. Unless the District's effluent perfectly matches the water chemistry of the Sacramento River at all times, it will affect the water quality in at least some way. It is a fact of life that the volume of water in the Sacramento River is typically 50 times greater than the volume of the discharge of treated effluent (just as the Pacific Ocean is more voluminous than the City of San Diego's discharge). The appropriate inquiry concerns the effect of the District's discharge on receiving water quality and beneficial uses and whether it is necessary or appropriate to impose extremely costly obligations in order to protect these beneficial uses. We also note that the proposed effluent limitation for nitrate is more stringent than limitations that have been imposed on EDW dischargers, by more than an order of magnitude.

With respect to costs, the Tentative Permit would vastly increase the wastewater utility rates paid by residents of all economic classes. The Tentative Permit's approach to this issue is cavalier: as long as someone elsewhere pays a given amount, there is no reason the Sacramento region's citizens should not do the same. That residents of some areas pay more than residents of other areas for wastewater utility service is not a reason, above all in these economic times, to simply raise the costs for the Sacramento region. If there is to be a policy to equalize the cost of wastewater utility service throughout the state (or the cost of other essential public services), that policy should be developed and explained. Failing that, the Regional Board should regulate the District based on the law, specific circumstances, sound science, and reason.

The District has a number of additional, significant concerns and recommendations, which we address in the materials that follow.

Immediately attached are more specific comments and evidence. We also provide several enclosures that relate to these and other issues for consideration and as part of these comments.

The Tentative Permit has enormous implications for the District and the region, and poses numerous issues related to complex topics. The time allowed for review and comment has been extremely short under the circumstances. If you require clarification or other information, or have any questions regarding our comments, please contact Robert Seyfried at (916) 876-6068 and seyfriedr@sacsewer.com.

Finally, and based on confirmation from Regional Board staff counsel, Mr. David R. Coupe, these materials are being filed on October 11, 2010 due to October 8, 2010 being a furlough day.

Sincerely,

Stan R. Dean
District Engineer

Enclosures

I. DISINFECTION REQUIREMENTS (PATHOGENS)

The Regional Board has adopted a water quality objective for the protection of the REC-1 beneficial use. (Water Quality Control Plan for the Sacramento River and San Joaquin River Basins, Fourth Edition – 1998 (Basin Plan) at p. III-3.00.) The current NPDES permit for the District already contains effluent limitations for pathogens that are considerably more stringent than this water quality objective. The Tentative Permit proposes new requirements for total coliform and turbidity of effluent (and related biochemical oxygen demand (BOD) and total suspended solids (TSS) requirements based on filtration technology) that would require the District to expend an estimated $1.3 billion (plus an additional $44-46 million annually for operation and maintenance), with no commensurate benefit to beneficial uses. The Tentative Permit is inconsistent with clear requirements of the Water Code, State Board precedential orders, and the Regional Board's own historic practice with respect to the consideration of any such requirements. It is also inconsistent with other adopted permits. Moreover, a proper analysis supports the conclusion that the proposed requirements are unnecessary and unreasonable.

A. Failure to Conduct Analyses Required by the Water Code

Water Code section 13241 provides:

> Each regional board shall establish such water quality objectives in water quality control plans as in its judgment will ensure the reasonable protection of beneficial uses and the prevention of nuisance; however, it is recognized that it may be possible for the quality of water to be changed to some degree without unreasonably affecting beneficial uses. Factors to be considered by a regional board in establishing water quality objectives shall include, but not necessarily be limited to, all of the following:
>
> (a) Past, present, and probable future beneficial uses of water.
>
> (b) Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto.
>
> (c) Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area.
>
> (d) Economic considerations.
>
> (e) The need for developing housing within the region.
>
> (f) The need to develop and use recycled water.

The Chief Counsel of the State Board, in a memorandum interpreting this provision[1], has explained the Regional Board's affirmative duty to develop and consider information on the section 13241 factors and to engage in a "balancing" of factors to develop objectives consistent with the statute.

Water Code section 13263(a) requires that, in the adoption of waste discharge requirements, the Regional Board take into consideration, among other things, the water quality objectives reasonably required to protect beneficial uses, as well as the provisions of Water Code section 13241. The State Board has previously recognized that a complete analysis of the Water Code section 13241 provisions is essential when, as here, the Regional Board proposes to adopt effluent limitations more stringent than those required by adopted water quality objectives. If a Regional Board takes this approach, ". . . the rationale for the more stringent limitations must be explained in the Permit findings . . . . In addition, the Regional Board must consider the factors specified in Water Code Section 13241." (*In the Matter of the Petition of City and County of San Francisco, et al.*, State Board Order No. WQ 95-4, at pp. 12-13; see also *In the Matter of the Petitions of Napa Sanitation District, et al.*, State Board Order No. WQ 2001-16, at p. 24.)[2] That is, if the Regional Board chooses to implement a more stringent objective on a permit-specific basis, as is proposed in the Tentative Permit, it "must consider the factors specified in Water Code Section 13241." (*In the Matter of the Petition of the Cities of Palo Alto, Sunnyvale and San Jose*, State Board Order No. WQ 94-8, at pp. 8-9.)

A conclusory assertion that the Regional Board has considered the Water Code section 13241 requirements is insufficient. The State Board has explained that, "when a Regional Board includes permit limits more stringent than limits based on an applicable numeric objective in the relevant basin plan, the Regional Board must address the section 13241 factors in the permit findings. These factors include, among others, economic considerations, environmental characteristics of the hydrographic unit under consideration, and the need for recycled water." (*In the Matter of the Review on Own Motion of Waste Discharge Requirements Order No. 5-01-044 for Vacaville's Easterly Wastewater Treatment Plant*, State Board Order No. WQ 2002-0015, at p. 35.) As such, the Regional Board must make findings related to each of the provisions of Water Code section 13241. (See, e.g., State Board Order No. 2002-0015, at p. 35 [issue remanded and Regional Board directed to revise its findings to expressly address section 13241 factors which had not been addressed]; see also State Board Order No. WQ 95-4, at pp. 13-14 [permit remanded to Regional Board for failure to consider the factors specified in Water Code section 13241].) This Regional Board has previously acknowledged such an obligation by stating that, "in accordance with CWC section 13241," it is making specific

[1] Memorandum from William R. Attwater, Chief Counsel of the State Board to Regional Water Board Executive Officers re Guidance on Consideration of Economics in the Adoption of Water Quality Objectives (January 4, 1994).

[2] The District requests official notice of permits and orders referenced in these comments in accordance with section 648.2 of title 23 of the California Code of Regulations.

findings in relation to individual considerations including past, present, and future probable beneficial uses of water, environmental characteristics of the hydrographic unit, water quality conditions that could be reasonably achieved, economic considerations, the need for housing in the region, and the need to develop and use recycled water. (For just a few examples, see Order No. R5-2007-0031, at pp. F-21 - F-22; Order No. R5-2007-0036, at pp. F-40 - F-41; Order No. R5-2007-0039, at pp. F-43 - F-44.)

The Tentative Permit lacks consideration of "the water quality objectives reasonably required to protect beneficial uses" as required by Water Code section 13263(a). It lacks the required analysis and findings under Water Code section 13241. For these reasons alone, its adoption would be unlawful. To the extent the Regional Board would consider these new effluent limitations, it would be obliged, for each, to conduct a section 13241 analysis. As described below, such requirements would be improper and unreasonable. Last in this regard, the Tentative Permit includes a statement that, "The Regional Water Board previously considered the factors in CWC section 13241 in establishing these requirements in Order No. R5-2005-0074." (Tentative Permit at p. 6.) The referenced order, concerning a permit issued to Placer County, is of no relevance. It did not concern any of the facts and circumstances here, the District was not a party, and a reference to the Order—let alone an unexplained reference—cannot excuse noncompliance with Water Code sections 13263(a) and 13241 here.

B. Analysis of Tentative Permit Discussion, and Reasonable Protection of Beneficial Uses

The Tentative Permit is unclear and inconsistent in its discussion of the basis for the proposed effluent limitations for coliform and turbidity. For example, on page F-72, there is a heading titled "RPA Results." A reasonable potential analysis (RPA) inquires into whether there is reasonable potential to cause or contribute to exceedance of a water quality standard. The adopted water quality standard is on page III-3.00 of the Basin Plan, yet there is no reasonable potential analysis related to that or any other standard. In fact, the RPA section identifies no water quality standard at all in its "RPA" analysis; the section is simply an argument for a specific effluent quality. Likewise, the "water-quality based effluent limit" (WQBEL) discussion on page F-76 identifies no instream water quality standard being implemented; it simply specifies an effluent quality. Thus, there is no basis to conclude there is reasonable potential to cause or contribute to exceedance of a water quality standard, and no properly derived WQBEL. Further, overall, the Tentative Permit ignores altogether the implications of the inconsequential effects on beneficial uses associated with current effluent limitations and effluent quality.

The Tentative Permit is simply wrong when it says that "the undiluted effluent may be used for the irrigation of food crops and/or body contact recreation." (Tentative Permit at p. F-72.) Indeed, it contradicts this statement on page F-73, recognizing that undiluted effluent will not be drawn into agricultural intakes. On page F-73, the Tentative Permit states, "It appears that undiluted effluent will not be drawn into the agricultural intakes, but varying mixtures of effluent

and river water will be diverted from the partially mixed discharge plume." However, the District has provided information to the Regional Board that indicates that it is highly unlikely that water influenced by the effluent plume will be drawn in to the intakes downstream of its outfall.

In 2004, the District consulted a knowledgeable engineer who works with 25 Reclamation Districts in the Delta.[3] He indicated that there were three types of pump designs used for withdrawing water from the Sacramento River: a vertical pump, a slant pump, and a siphon pump. Vertical pumps are set on a platform with a pipe going down vertically into the water. Slant pumps have a pipe running along the face of the levee. Siphon pumps are not used in the area near the District's outfall. Use of siphon pumps starts further south on the Sacramento River near Rio Vista. Neither slant nor vertical pumps go much below the surface with a typical depth between five feet and ten feet below mean sea level. In fact, they are shallow enough that they run the risk of the pump cavitating at low tide. In addition, the pipes from these pumps do not stick out horizontally into the water. Therefore, they would draw water near the riverbank and, in general, outside the influence of diluted effluent.

Dynamic modeling has shown that up to 700 feet downstream of the discharge, no effluent (diluted or undiluted) is present in the river within approximately 100 feet of the riverbank on both sides of the river. Typically, dilution is far greater than 20:1. At Harmonic Mean Flows, the river:effluent flow ratio is 56:1 for 181 mgd of effluent flow. At critical low river flows as represented by the 7Q10 (i.e., 5820 cfs), dilution is 21:1. River flows as low as the 7Q10 occur infrequently. Between 1970 and 2009, river flow was at or below the 7Q10 approximately 0.58% of the time.

The Tentative Permit presents a confusing discussion related to "Title 22" and Department of Public Health's (DPH) recommendations. Again, as a starting point, the Tentative Permit fails to recognize at all the adopted water quality standard for fecal coliform that undeniably applies to the Sacramento River. The DPH reclamation criteria are not well explained in the Tentative Permit. The DPH regulations prescribe effluent quality for "use of recycled water that has been transported from the point of treatment or production to the point of use *without an intervening discharge to waters of the State*." (Cal. Code Regs., tit. 22, § 60301.200, emphasis added.) There is no such use here. Setting aside the lack of direct use, the Tentative Permit does not acknowledge that there are other reclamation criteria applicable where recycled water does not come into direct contact with food or people. (See, e.g., *id*., §§ 60304(b) & (d), 60301.225.) Instead, it implies that the only criteria that exist are the requirements for tertiary effluent, which are only applicable to recycled water that comes into direct contact with food crops eaten fresh or to impoundments of recycled water for recreation. (*Id*. at § 60304(a)(1).) These circumstances

[3] R. Seyfried, SRCSD. Letter to K. Landau, CVRWQCB. Sacramento Regional County Sanitation District, NPDES Permit Responses to Comments Raised at Meeting of November 19, 2004. December 15, 2004.

are not present or remotely close to present. The reclamation regulations thus have no application or relevance here.

The statement in the Tentative Permit (p. F-75) that "any increased risk . . . is not protective" of beneficial uses ignores the provisions of Water Code sections 13000, 13001, 13241, and 13263. (Nor has any change in risk at all been identified with respect to any actual use of water for irrigation of food crops eaten fresh or for municipal use.) Moreover, the Tentative Permit does not propose limits to prevent increase in risk; it proposes limits for effluent water quality far superior to the quality of the receiving water.

The reference within the Tentative Permit on pages F-73 and F-74 to Dr. Robert Emerick's study on UV disinfection of wastewater particles is not relevant to the discussion of relative risks to contact recreation due to protozoan pathogens. The Tentative Permit states that, "[C]entral Valley Water Board staff requested guidance on whether Dr. Emerick's research that the Discharger's effluent had high (20) percent of coliform associated particles could be underestimating the pathogenic risk of the discharge." The focus of the study was on UV disinfection of particle-associated coliform bacteria. The researchers collected effluent samples prior to disinfection from several locations in California, including SRWTP. One component of the study was to analyze the fraction of wastewater particles that harbored coliform bacteria—the result to which the Tentative Permit refers. The study included no speculation of the pathogenic risk associated with any treatment plant, let alone one using chlorine disinfection, based on the particle-association results.

The Tentative Permit remains confusing with its reference to DPH "recommendations." It states that wastewater must be "treated to a level equivalent to that recommended by DPH." (Tentative Permit at p. F-72.) However, in a contrary statement several pages later, the Tentative Permit states that, "DPH recommendations are not directly implemented by this permit." (Tentative Permit at p. F-75.) Yet, the Tentative Permit ultimately makes a conclusion that the "[r]equirements of Title 22 will be adequate to meet the 1 in 10,000 risk and 1 log removal recommended by DPH." Based on these statements, it appears that the filtration (or "equivalent") requirements in the permit are being proposed to require the District's effluent to meet a 1 in 10,000 risk for illness for the REC-1 as identified in the letter from DPH dated June 15, 2010. This risk level is not met upstream of the SRWTP, and far exceeds the recommended risk levels from the U.S. EPA and those that apply to bathing beaches. The 1:10,000 risk of infection per year is what has been provided by the U.S. EPA as guidance for fully treated tap water (drinking water), not for contact recreational freshwaters, and few rivers in the United States could meet that proposed risk level. The U.S. EPA's 1986 Ambient Water Quality Criteria for Bacteria (1986 Criteria) established criteria for *E. coli* and fecal coliform using accepted illness rates of 8 illnesses per 1,000 swimmers (0.8%) in freshwater and 19 illnesses per 1000 swimmers (1.9%) at marine beaches. The U.S. EPA national criteria are based on extensive epidemiological studies and have been in effect since 1986 to provide protection for water contact recreation in surface waters across the country. These standards apply to all surface recreational waters regardless if they are directly influenced by treated

wastewater or not. DPH has provided no support for its proposed risk level and therefore the Regional Board's reliance on this level in any way has no basis or evidentiary support, and further it does not consider the provisions of the Water Code. Thus, the Regional Board cannot rely on this risk to justify filtration requirements.

While the U.S. EPA is currently considering revised recreational standards, the revisions are not focused on revising the acceptable risk levels. The risk levels from the 1986 Criteria have been used in recent U.S. EPA criteria. In 2000, Congress passed the Beaches Environmental Assessment and Coastal Health Act of 2000 (Pub.L. No. 106-284 (Oct. 10, 2000) 114 Stat. 870) (BEACH Act) which required states to either adopt the U.S. EPA 1986 Criteria or adopt criteria "as protective" as the U.S. EPA recommendation. The U.S. EPA's 2004 Water Quality Standards for Coastal and Great Lakes Recreation Waters[4] promulgated water quality criteria for the remaining states that had not yet adopted protective criteria, putting in place criteria corresponding to an illness rate of 0.8% for swimmers in freshwater.

Dr. Charles Gerba prepared the preliminary risk assessment report and a revised report titled "Estimated Risk of Illness from Swimming in the Sacramento River" (Estimated Risk Report) which was submitted to the Regional Board in February 2010. The Estimated Risk Report, which was based on a very conservative set of assumptions, contained probabilities of acquiring an illness from *Giardia, Cryptosporidium,* and from a combined effect (additive risk from both protozoa) of *Giardia* and *Cryptosporidium* from one and ten swimming events, which were calculated at four locations on the Sacramento River and for the 20:1 diluted effluent. In no case did the risks exceed those currently recommended by the U.S. EPA for contact recreation. In all cases the risk of illness was below the U.S. EPA acceptable risk value for acquiring an illness or infection for a single event or for multiple events by two to three orders of magnitude. Furthermore, the SRWTP discharge does not result in a substantial increase in risk of waterborne disease in the receiving water, and there is no evidence even suggesting that it does.[5]

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[4] 40 C.F.R. Part 131, 69 Fed. Reg. 67218-67243.

[5] We also enclose a copy of an August 2010 report prepared by the Sacramento County Department of Health and Human Services, titled "Cryptosporidiosis and Giardiasis Surveillance Report – 1994-2008." The objective of the report was to assess Cryptosporidiosis and Giardiasis incidences in Sacramento County, select surrounding counties, including Delta counties, and the state of California. In the report, public health analysts conducted statistical analyses of data from Sacramento County, the surrounding counties of El Dorado, Yolo, Solano, Contra Costa, San Joaquin, and Stanislaus, and the State of California to determine and compare Cryptosporidiosis and Giardiasis infection rates in those jurisdictions. Infection data were evaluated by age, gender, ethnicity, geographic location, and time period to reveal any patterns in infection rates.

The report presents evidence that local infection rates are not higher than statewide rates and are not remarkable in any way. Specifically, analysis of Cryptosporidiosis infection rates from 1994 to 2008 shows that infection rates in Sacramento and Delta counties are low and are consistent with statewide rates. Analysis of Giardiasis incidences from 2004 to 2008 indicate Sacramento and Delta county rates are consistent with statewide rates, with the exception higher rates in Sacramento County in 2004 and 2005. Those two years of higher incidences are limited to

FOOTNOTE CONTINUED ON FOLLOWING PAGE.

Dr. Gerba used conservative assumptions for ingestion volume, effluent dilution ratio and *Giardia* inactivation in his risk analysis. These each introduce significant increases in the projected risk, which cumulatively exceed an order of magnitude. Use of a 100 ml ingestion volume, instead of other ingestion volumes which are more typically used for swimming (37 ml) or for incidental ingestion associated with various recreational uses that typically occur in the Sacramento River downstream of the discharge, increases the risk estimate by factors of 3 to 10. In scientific literature that evaluates risk, 100 ml is the highest volume used for an ingestion amount, while lower volumes are more typically used. In addition, Dr. Gerba calculated risk for 20:1 diluted effluent, which represents a worst-case scenario which is not typically the condition in the Sacramento River. The expected frequency of occurrence of a 20:1 dilution ratio is less than 0.2%. Furthermore, Dr. Gerba estimated *Giardia* inactivation based on a literature value for *Cryptosporidium* inactivation, as there is no data reported on *Giardia* viability in wastewater effluents. However, *Giardia* is much more susceptible to inactivation by free chlorine and chloramines than *Cryptosporidium*[6] and therefore would experience greater inactivation by chloramines in the SRWTP effluent before discharge. Using an analysis with assumptions more realistic than the conservative assumptions in the Estimated Risk Report, the Sacramento River downstream of the SRWTP outfall would definitely approach, and may achieve, the 1:10,000 risk level recommended by DPH. Dr. Gerba provides further analysis and conclusions in accompanying material, which constitutes additional comment and evidence.

The Tentative Permit makes one reference to use of the Delta for water supplies, but supplies no facts or logic suggesting such use is not adequately protected. For example, *Giardia* and *Cryptosporidium* are not detected frequently in State Water Project waters according to the 2006 State Water Project Sanitary Survey. The source of waters for all of the drinking water treatment plants analyzed were classified as Bin 1 (no additional treatment required under Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)).

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three zip code areas that experienced high influxes of Hmong and Russian immigrants during that period, which the report proposes as the probable source of the localized high infection rates.

The analyses in the report indicate that Cryptosporidiosis and Giardiasis incidences in Sacramento and Delta counties are not remarkable and are consistent with statewide rates. The District understands that the report does not definitively prove that SRWTP does not have public health effects. However, it certainly does not suggest a record of waterborne disease linked to contact with waters in the Sacramento River or Delta downstream of the SRWTP.

[6] U.S. EPA. 1991. Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems using Surface Water Sources. U.S. Environmental Protection Agency, Washington, DC.

C. The Tentative Permit Ignores the DPH 20:1 Dilution Guideline and Historic Permitting Practice

In a letter to the Regional Board dated 8 April 1999, DPH indicated it would consider wastewater discharged to water bodies with identified beneficial uses of irrigation or contact recreation and where the wastewater receives dilution of more than 20:1 to be adequately disinfected if the effluent coliform concentration does not exceed 23 MPN/100 mL as a seven-day median and if the effluent coliform concentration does not exceed 240 MPN/100 mL more than once in any thirty day period. DPH has reiterated this advice in a letter dated July 1, 2003: "A filtered and disinfected effluent should be required in situations where critical beneficial uses (i.e., food crop irrigation or body content recreation) are made of the receiving waters unless a 20:1 dilution ratio (DR) is available. In these circumstances, a secondary, 23 MPN discharge is acceptable . . . . For wastewater discharges into streams that experience tidal influences an instantaneous DR of less than 20:1 is acceptable as long as the average for each day exceeds 20:1."[7] Daily dilution of the SRWTP effluent is always greater than 20:1, and ordinarily it is considerably greater. For the entire period of January 1, 1998, through January 1, 2010, daily average dilution for a discharge at 181 mgd would have never been below 20:1. The Regional Board has conformed its permitting practice to the 20:1 guideline.[8] The District has reviewed 56 recent Region 5 permits, including 22 from 2007, 19 from 2008, 10 from 2009, and 5 from 2010. A list of the reviewed permits is enclosed. Thirty-three permits found less than 20:1 dilution, and 18 found more than 20:1 dilution. Of the permits allowing less than 20:1 dilution, all contained total coliform effluent limits of 2.2 MPN/100 mL as a 7-day median. Of the 18 allowing more than 20:1 dilution, 16 contained total coliform effluent limits of 23 MPN/100 mL as a 7-day median (or higher). Two contained total coliform effluent limits of 2.2 MPN/100 mL as a 7-day median. In other words, 16 of 18 permits issued to similarly situated dischargers in the 2007-2010 period *did not* include the limits imposed here for coliform and related constituents.

The two exceptions involved different circumstances. The two permits imposing tertiary limits even though 20:1 dilution was available were for the City of Angels Wastewater Treatment Plant, Order No. R5-2007-0031 (NPDES No. CA0085201), and the Ironhouse Sanitary District Wastewater Treatment Plant, Order No. R5-2008-0057 (NPDES No. CA0085260). Importantly, in both of these instances, the publicly owned treatment works (POTW) itself was proposing to discharge Title 22 tertiary effluent. The City of Angels permit reflects that the City's own mitigated negative declaration required treatment equivalent to Title 22 tertiary. The Ironhouse

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[7] Letter from David Spath, Chief, Division of Drinking Water and Environmental Management, to Thomas Pinkos, Executive Officer, Central Valley Regional Water Quality Control Board (July 1, 2003).

[8] While the District believes the guideline may be unnecessarily conservative and there are rulemaking considerations associated with the guideline, the present point is that the guideline has been ignored and the Tentative Permit is inconsistent with historic practice.

Sanitary District's own Environmental Impact Report and antidegradation analysis for a new discharge were based on a Title 22 tertiary treatment facility.[9]

In short, the Regional Board has consistently applied a 20:1 logic in determining whether to impose tertiary requirements. The only exceptions involved circumstances not present here. "Similarly situated dischargers" are not required to meet Title 22 tertiary limits, and the Regional Board should apply a total coliform effluent limit of 23 MPN/100 mL as a seven-day median.

D. Water Code Sections 13263 and 13241 Considerations

As discussed previously, the Regional Board could not adopt the proposed limitations without compliance with Water Code section 13263(a), which requires consideration of beneficial uses to be protected, water quality objectives reasonably required for that purpose, other waste discharges, and the provisions of section 13241 of the Water Code. Upon proper consideration, for reasons identified above and below, and in the record, the proposed requirements are not appropriate.

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[9] The relevant sections of these permits were in Attachment F (Fact Sheet) IV.C.2 Section n. Pathogens (p. F-20) of the City of Angels permit, and IV.C.3 Section s. Pathogens (p. F-30) of the Ironhouse Sanitary District permit. The District provides this information for convenience, while emphasizing that the two POTWs themselves sought permits based on Title 22 tertiary facilities and there is no indication that any of the findings were contested y the permittees. Specifically, the City of Angels permit language is as follows:

> The discharge of tertiary treated wastewater at Discharge Point – 001 is prohibited except from November 15 through May 15, when Angels Creek flows provide a downstream flow ratio greater than or equal to 20:1 (Angels Creek flow : effluent) as a daily average . . . .
>
> The Discharger developed a mitigated negative declaration in accordance with CEQA for its proposed discharge of treated municipal wastewater discharged to Angels Creek. The mitigated negative declaration includes a mitigation measure that requires the wastewater discharged to Angels Creek, during times of high stream flow, be treated to a level of treatment equivalent to Title 22 tertiary.

The Ironhouse Sanitary District permit language is as follows:

> Typically the Regional Water Board requires Title 22 or equivalent tertiary treatment when there is less than 20:1 dilution, based on recommendations by the CDPH. However, as discussed above in the Fact Sheet at Section IV.C.2.c., the discharge has at least 20:1 dilution at all times. Although there is 20:1 dilution, tertiary level treatment is required based on the following:
>
> a. The Discharger developed its EIR and antidegradation analysis based on a Title 22 or equivalent tertiary treatment facility.
>
> b. There are four water intakes within ten miles of the discharge. Therefore, providing a high level of disinfection is appropriate to protect the MUN beneficial use.
>
> c. This is a new discharge to the Delta. With the significant pelagic organism decline, the fragile nature of the Delta, unknown Delta stressors and recent legal decisions on water supply diversions within the Delta, it is prudent to require a high level of treatment for new discharges.

Initially, with respect to Water Code section 13263 and consideration of the water quality objectives reasonably required to protect beneficial uses, the Regional Board would be required to identify such objectives and articulate why the Basin Plan water quality objective, which manifestly applies to the Sacramento River, is not the objective reasonably required to protect beneficial uses.

With respect to Water Code section 13241 and beneficial uses (Wat. Code, § 13241(a)), the beneficial uses of the receiving water are not in dispute. However, the Tentative Permit is not objective or balanced in its characterizations. For example, it is of little relevance to say that the Sacramento River and Sacramento-San Joaquin Delta supports 12 million recreational user days per year. (Tentative Permit at p. F-91.) This number greatly overstates the use of the lower Sacramento River below the SRWTP discharge. In addition, non-contact recreational use such as hiking, sightseeing, birdwatching, and any other recreational activities distant from the immediate receiving water are not pertinent to the issue of impacts associated with the SRWTP discharge. Risk calculations referred to in the Tentative Permit are based on swimming. Risks associated with fishing and boating are much lower. And, any affect on risk that could be attributable to the SRWTP diminishes as water moves downstream due to fate and transport processes and any additions of flow from other sources. The District does not dispute that downstream waters should have protection of REC-1 beneficial use consistent with the Water Code, but the Tentative Permit is not forthright in regard to the nature and extent of the affected recreational beneficial use. If it is to go beyond saying REC-1 is a beneficial use, the analysis should be objective.[10] We note, for instance, that there is a "very high level of public contact" with the Pacific Ocean, the most downstream receiving water. That, in and of itself, means little, and would be an unreasonable consideration in this permitting process. More to the point, the Tentative Permit provides no information that demonstrates an unreasonable risk to any recreational users of the lower Sacramento River. With respect to irrigation, there is no identification of spray irrigation of food crops eaten fresh, which would be the appropriate level of protection under Title 22 requirements for crops irrigated with undiluted effluent. The Tentative Permit fails to demonstrate that there is such direct use of undiluted SRWTP effluent at any location along the Sacramento River. The District agrees that adequate protection of REC-1 will provide adequate protection of irrigation uses.

The hydrographic unit under consideration is the Sacramento River downstream of the SRWTP; the quality of water available thereto is the Sacramento River itself. (Wat. Code, § 13241(b).) The Regional Board must consider the water quality that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area. (Wat. Code,

[10] Note also the email correspondence from Mr. Lischeske of DPH dated July 27, 2009 (previously provided to the Regional Board) which states: "Since a relatively small number of people actually get in the Sacramento River below the SRCSD outfall, we don't have a large population to protect from exposure to the effluent."

§ 13241(c).) The Tentative Permit does not do so. However, it uses a standard of 2.2 MPN/100 ml as a basis for regulation. Such standard is not, and cannot, be attained in the Sacramento River. (To the extent the Regional Board would apply section 13241(c) to the effluent only, this would be inconsistent with Water Code sections 13263(a) and 13241. In any event, it is not reasonable as applied to the effluent.) The projected capital and operation and maintenance costs are extreme. The Regional Board is obliged to consider and balance these factors. The proposed requirements would adversely affect the need to develop housing in the region, by driving up the cost of housing through increased connection fees and users charges which directly affect the cost of living in a house. (Wat. Code, § 13241(e); see section IV.E.1.a. post.) The Tentative Permit fails in the duty to develop, consider, and balance information on this subject.

The Regional Board must also consider the need to develop and use recycled water. (Wat. Code, § 13241(f).) Implementing full Title 22 tertiary treatment at SRWTP would significantly reduce the incentive and ability to recycle water, by diverting potential resources away from recycled water projects to a major filtration and disinfection treatment project. To the extent recycled water uses require tertiary effluent, the demand can be met by sizing facilities (or, potentially, constructing satellite or scalping facilities) to meet the demand. Demand for recycled water only equates to a fraction of SRWTP flow. Expensive, advanced treatment for the entire flow requires allocation of additional funds that do not serve projected recycled water needs. Thus, requiring full tertiary treatment at SRWTP would act as a substantial economic disincentive to the development and use of recycled water by the District and would hinder rather than facilitate the development of recycled water in the Sacramento region.

Additionally, the District needs to partner with willing water purveyors to implement recycled water projects in their service areas since the District is not a water purveyor. Most of these water purveyors have other water supplies that are more readily available and less expensive compared to the use of recycled water at this time. Lack of funding is one of the key elements that affect the implementation of recycled water projects throughout the state and the Sacramento area. Thus, requiring full tertiary treatment at SRWTP will exacerbate this problem.

The specific factors listed in Water Code sections 13241(a)-(f) are not exclusive. (Wat. Code, § 13241 [factors "shall include, but not necessarily be limited to . . . [factors in § 13241(a)-(f)]."].) For example, energy demands associated with new treatment processes (and associated greenhouse gas emissions) must be considered to satisfy the Regional Board's obligations under sections 13241 and 13263 of the Water Code.

In consideration of all these factors, the discussion above, and other material submitted by the District, the proposed tertiary treatment requirements are not appropriate.

E. Filtration Is Not BPTC for the SRWTP

The Tentative Permit, on page F-91, includes the statement that the "equivalent of Title 22 [tertiary] filtration" is BPTC. The District disagrees. Section IV below discusses the "Satisfaction of Antidegradation Policy" section of the Tentative Permit in detail. With respect to the listing on page F-75 of the other publicly owned treatment works (POTWs) that implement tertiary treatment and discharge to the Delta, those POTWs are not similarly situated to the District. These POTWs discharge to effluent dominated waterbodies (EDWs) or areas where the Regional Board has found that adequate dilution does not exist, or are new discharges, or have themselves proposed tertiary treatment. Entirely missing from the list in the Tentative Permit are POTWs that do not implement tertiary filtration such as those described in section I.C above and the penultimate paragraph of section IV.E.2.b. below, which are similarly situated to the District.

F. Other Considerations

Page F-75 of the Tentative Permit states that tertiary filtration will or may reduce discharge of other water quality constituents to an unspecified degree. The Regional Board has, of course, authority to require WQBELs where appropriate (and the Tentative Permit proposes WQBELs for some of the described water quality constituents). The Regional Board may not dictate how the District achieves compliance. The general reference to potential effects of filtration does not support the requirement. With respect to BOD and dissolved oxygen specifically, the District has proposed that the SRWTP be regulated to limit discharge of oxygen-demanding substances. The Tentative Permit makes no demonstration that reductions in the listed constituents will provide an important incremental benefit in terms of compliance with objectives or protection of beneficial uses.

G. Alternatives

Based on the discussion above, the District recommends the adoption of Disinfection Alternative 1 from the Tentative Permit Options, as well as BOD and TSS provisions consistent with the current permit.

II. REQUIREMENT FOR NITRIFICATION

A. The Tentative Permit Improperly Finds That Full Nitrification Is Necessary to Protect Aquatic Life Beneficial Uses in the Delta

The Tentative Permit, in conjunction with Attachment K, proposes to adopt very low final effluent limitations for ammonia, without the consideration of dilution, purportedly to protect aquatic life beneficial uses in the Delta. The low limits proposed would require the District to employ advanced treatment at the SRWTP at a level that would require full nitrification of effluent.

In support of the limits, the Tentative Permit makes a number of statements as to why it is appropriate to require full nitrification. However, the findings in the Tentative Permit are not supported by the evidence and would be improper if adopted as proposed. To the extent the Tentative Permit suggests the limits are proper because they *might* be necessary, this is also improper. The Regional Board may of course, reopen a permit if new information becomes available. But there is no justification for full nitrification on the existing evidence.

1. The Evidence Identified in the Tentative Permit Does Not Substantiate the Hypothesis That Ammonia Impacts Pelagic Organism Decline (POD) Species

Attachment K offers 3 potential connections between ammonia in SRWTP effluent and the pelagic organism decline (POD): (1) inhibition of diatom primary production in the Sacramento River, Suisun Bay, and the Delta; (2) causation of acute and/or chronic toxicity to delta smelt and *P. forbesi*, an important food organism for larval and juvenile fish; and (3) contribution to a shift in the algal community from "nutritious species of diatoms" to "less desirable forms like *Microcystis* (blue-green algae)." These hypotheses have been addressed energetically during the last 3 years by researchers funded by the Regional Board, the Interagency Ecological Program (IEP), CalFed, and several stakeholders. None of the studies completed on these topics justify full nitrification at the SRWTP. In fact, several of the studies that have been completed have essentially eliminated concern in one of these areas (e.g., ammonia toxicity to Delta fish species).

a. The Tentative Permit Identifies Significant Uncertainty Associated with Supposed Ammonia Impacts on the Delta Food Web

The Tentative Permit recognizes the significant uncertainty associated with these hypotheses, and by its own terms calls into question the existence of evidence to support full nitrification. For example, the Tentative Permit includes the following statements:

- "The overall impact of the nitrogen uptake inhibition, particularly on Delta smelt food, is not understood. Inhibition of nitrogen uptake in freshwater portions of the Delta has not been proven." (Tentative Permit Options at p. 4.)

- "The causes of low primary production are not understood . . . A combination of . . . factors . . . may contribute to the low diatom abundance now present in the Bay." (Tentative Permit at p. K-5.)

- ". . . chlorophyll-a concentrations decrease as the Sacramento River flows toward the Delta. The decrease in chlorophyll appears to commence above the SRWTP . . . . The SRWTP discharge cannot be the cause of…decline upstream of the discharge point, and may not be contributing to the decline downstream of the discharge point." (Tentative Permit at p. K-6.)

- "Scientists studying the Delta have not reached a consensus on whether ammonia is either inhibiting diatom primary production or shifting algal communities." (Tentative Permit Options at p. 6.)

- ". . . adverse impacts from changed nitrogen:phosphorus ratios in the Delta have not been demonstrated. The overall impact of nitrogen on the Delta is not understood." (Tentative Permit Options at p. 7.)

- "Follow up studies are needed to determine the ecological effect of the change in nutrient concentrations and ratios on the phytoplankton community . . . ." (Tentative Permit at p. K-7.)

- "Toxicity impacts from ammonia to more sensitive aquatic life, such as copepods, are continuing to be evaluated . . . current findings need to be confirmed before the information can be used to determine that beneficial uses are impacted." (Tentative Permit Options at p. 6.)

b. Independent Reviews and Reports Do Not Conclude That Ammonia Has Contributed to the POD

The theories regarding ammonia's potential role in the Delta (or San Francisco Estuary (SFE)) ecosystem, and the strength of evidence emerging from the research activities, have been subjected to repeated analysis during the last 3 years through independent review panels, focused workshops, and agency reports. Significantly, none of the independent or agency reviews have reached a determination that ammonia has contributed to the POD. Recent proceedings through which the state of science regarding ammonia and the POD has been considered by independent panels or agency staff, include:

- 2009 SWRCB Comprehensive Review of the Bay-Delta Plan, Water Rights and Other Requirements to Protect Fish and Wildlife Beneficial Uses and the Public Trust

- CalFed Science Program Workshop: The development of a research framework to assess the role of ammonia/ammonium on the Sacramento-San Joaquin Delta and Suisun Bay Estuary Ecosystem, March 10-11, 2009

- IEP/Central Valley Regional Water Quality Control Board "Ammonia Summit" (August 18-19, 2009)

- SWRCB Informational Proceeding to Develop Flow Criteria for the Delta Ecosystem (March 22-24, 2010)

- National Academy of Science Committee on Sustainable Water and Environmental Management in the California Bay-Delta (convened January 2010)

- National Center for Ecological Analysis and Synthesis (NCEAS), Santa Barbara, California (ongoing)
    - Project 12198: Potential role of contaminants in declines of pelagic organisms in the upper SFE
    - Project 12192: Ecosystem analysis of pelagic organism declines in the upper SFE
    - Project 12122: Evaluation of declines of pelagic organisms in the upper SFE
- IEP POD Contaminant Work Team (ongoing), and its Ammonia Subcommittee

Excerpts from work products stemming from the above proceedings, and other communications from recognized Delta experts, reveal the state of science surrounding ammonia in the SFE and the insufficiency of evidence available to affirmatively link SRWTP ammonia discharges to POD.

i. Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem, August 3, 2010[11]

The State Board's recent Delta Flow Criteria report was prepared after submittal of written testimony to the State Board by interested parties, followed by a panel of scientists addressing "other stressors." Thus, the State Board Delta Flow Criteria report reflects a present consideration of the best available scientific understanding of stressors on the Delta ecosystem and was derived from extensive input received from the top scientists in the Delta, various concerns and hypotheses were noted regarding ammonia and nitrogen effects in the Delta. The conclusion from this effort is that more study is needed to test the validity of various hypotheses, as reflected in the following excerpts from that report:

> There is concern that a number of non-303(d)-listed contaminants, such as ammonia . . . could also limit biological productivity and impair beneficial uses. More work is needed to determine their impact on the aquatic community. (SWRCB 2010, pp. 35-36.)
>
> More experiments are needed to evaluate the effect of nutrients, including ammonia, on primary production and species composition in the Sacramento River and Delta. (SWRCB 2010, p. 93.)

[11] State Water Resources Control Board (2010) Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem. August 3, 2010 (SWRCB (2010)).

> Seven-day flow-through bioassays by Werner et al. (2008, 2009) have demonstrated that ammonia concentrations in the Delta are not acutely toxic to delta smelt. Monthly nutrient monitoring by Foe et al. (2010) has demonstrated that ammonia concentrations are below the recommended USEPA (1999) chronic criterion for the protection of juvenile fish. (SWRCB 2010, p. 36.)
>
> Results from the nutrient monitoring suggest that ammonia-induced toxicity to fish is not regularly occurring in the Delta. (SWRCB 2010, p. 36.)

ii. Nutrient Concentrations and Biological Effects in the Sacramento-San Joaquin Delta, Central Valley Regional Water Quality Control Board, June 2010[12]

This report contains a recommendation for future study to "conduct experiments in the Sacramento River below the City of Rio Vista to determine the effect of ammonia and other nutrients on primary production rates and algal species composition." Statements made in the report clearly indicate that effects of ammonia in the Delta have not been established, and that the benefit of reducing levels of ammonia is uncertain.

> The cause of the algal decline [in the Sacramento River] is not known . . . the decline began above the POTW [SRWTP] and continued downstream. (Foe et al. (2010), p. 12.)
>
> No information exists on the effect of ambient ammonia concentrations on algal production downstream of Isleton in the Delta. (Foe et al. (2010), p. 6.)
>
> The study found that ammonia did not inhibit primary production rate measurements in the Sacramento River below the SRWTP when normalized by the amount of chlorophyll present in the bottles. (Foe et al. (2010), pp. 6, 19.)

iii. Regional Board Aquatic Life Issue Paper, April 28, 2010

The Aquatic Life Issue Paper prepared by the Regional Board on April 28, 2010 (p. 7), states:

> . . . many of the key studies (to answer questions relating to SRWTP's discharge, primary productivity and the POD) are not yet complete and will not be available in time for consideration by the Central Valley Water Board as part of the SRCSD's NPDES permit renewal. (Aquatic Life Issue Paper, p. 7.)

[12] Foe, C., A. Ballard, and S. Fong (2010) Nutrient Concentrations and Biological Effects in the Sacramento-San Joaquin Delta. Central Valley Regional Water Quality Control Board, (July 2010). (Foe et al. (2010)).

iv. August 2009 Ammonia Summit Summary [Foe] September 24, 2009[13]

> A combination of the above three factors [ammonia levels that inhibit nitrate uptake by phytoplankton, high filtration rates by *Corbula*, and high turbidity levels] **may explain** the low diatom abundance now present in Suisun Bay. (Foe (2009), p. 2.)
>
> . . . there is no consensus yet demonstrating that elevated levels of ammonia in the Delta have caused a shift in the algal community from diatoms to less nutritious forms. (Foe (2009), p. 4.)
>
> . . . no evidence has yet been collected demonstrating that ammonia concentrations are causing beneficial use impairments in the Sacramento River or Delta. (Foe (2009), p. 3.)

Regarding the hypothesis that elevated ammonia levels were responsible for shifting the competitive advantage to blue-green algae such as *Microcystis* in the late summer, "The data collected to date are ambiguous." (Foe (2009), p. 3.)

v. Meyer, Joseph S. et al. (2009) *A Framework for Research Addressing the Role of Ammonia/Ammonium in the Sacramento-San Joaquin Delta and the San Francisco Bay Estuary Ecosystem*, Final Report Submitted to the CalFed Science Program, April 13, 2009 (Meyer et al. (2009))

A framework to assess the effects of ammonia in the Delta was developed in 2009 by a panel of independent national experts convened by CalFed. The panel determined that potential drivers for water quality and the structure and function of the Delta ecosystem include climate, water withdrawals, flow modifications, loadings of sediments, nutrients and contaminants, light and food web processes. With regard to the effects of ammonia, the panel stated that alternative hypotheses exist regarding the potential role of ammonium in the Delta, including the hypothesis that: ". . . ammonium enrichment [might not be] a prime factor responsible for . . . trophic and biogeochemical changes [in the Delta]." (Meyer et al. (2009), p. 3.)

[13] Foe, C. 2009. *August 2009 Ammonia Summit Summary*. Technical Memo to Jerry Bruns and Sue McConnell, Central Valley Regional Water Quality Control Board, 24 September 2009 (Foe (2009).)

The panel report also states that:

> . . . invasions of alien herbivores (e.g. overbite clam (*Corbula amurensis*) and Asian clam (*Corbicula fluminea*) during the past several decades . . . might be the major cause of declining standing stocks of phytoplankton. Finally, export of Delta water, altered hydrologic conditions and temperature increases accompanying recent climate changes might be major physical factors controlling the Bay-Delta estuarine communities (including populations of the POD organisms). (Meyer et al. (2009), p. 3.)

In a document providing comments on the draft panel report and responses to those comments, the subject of the importance of ammonia inhibition in Suisun Bay was directly addressed. In response to a comment by Richard Dugdale that the panel had ignored his unpublished research regarding ammonium suppression of nitrate uptake, the panel stated:

> . . . we do not believe the information provided . . . has conclusively demonstrated that the phenomenon is the dominant driver (i.e. to the exclusion of other factors including grazing and hydrologic variability) of phytoplankton production and composition in the Bay-Delta ecosystem. (Meyer et al. (2009) Responses to Review Comments about Draft Report (dated 20 March 2009): *A Framework for Research Addressing the Role of Ammonia/Ammonium in the Sacramento-San Joaquin Delta and the San Francisco Bay Estuary Ecosystem* (April 27, 2009) at p. 14.)

vi. Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta. Draft Report California Department of Fish and Game September 21, 2010 (DFG (2010))

The Delta Reform Act (Senate Bill No. 1 (SB 1) (Stats. 2009 (7th Ex. Sess.) ch 5, § 39)) required the California Department of Fish and Game (DFG) to identify quantifiable biological objectives and flow criteria for the species of concern in the Delta. In its September 2010 draft report, DFG included as a "finding": "1. Ammonia does not appear to be acutely or chronically toxic to delta smelt and other species. More research is needed on the effects of nutrients on Delta ecosystem and its foodweb." (Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta (Draft Document), DFG (Sept. 21, 2010) at p. 96.)

vii. Dr. Jim Cloern, May 2010 Email

Dr. Jim Cloern, a U.S. Geological Survey (USGS) aquatic ecologist with over 30 years of research experience studying primary productivity and other ecological processes in the San Francisco Bay-Delta, in a May 11, 2010, email to San Francisco Bay Regional Board staff and

others (previously provided to the Regional Board), questioned whether the reduced uptake of nitrate associated with ammonium inhibition actually translates into a growth rate effect. Dr. Cloern specifically questioned whether ammonium inhibits primary productivity and the importance of this inhibition (if it is occurring) compared to bivalve grazing. Dr. Cloern referred to the panel report from the March 2009 CalFed independent expert workshop as the basis for this question. More importantly, Dr. Cloern stated in the May 11 email that, "*the scientific community is far from consensus on questions related to the ecological significance of ammonium in the Bay-Delta system*."

viii. Dr. Peggy Lehman, March 2010 Email

Dr. Peggy Lehman, a Department of Water Resources expert in phytoplankton ecology in the Delta (in a March 19, 2010, email to Frances Brewster of the State Water Contractors, previously provided to the Regional Board) stated that her sampling of multiple stations in the San Joaquin River in 2000 and 2001 had shown diatoms were common in those samples, despite ammonium levels above the 4 μM threshold that has been proposed by Dugdale and Parker. Dr. Lehman stated that this suggests that ammonium levels may not necessarily have caused the dramatic loss of diatoms that has occurred in the Delta. She also stated that the influence of ammonium on phytoplankton is very complex.

2. Evidence in the Record Demonstrates That Ammonia Is Not Causing Acute or Chronic Toxicity to Delta Fish

As acknowledged by the Regional Board in Attachment K, ample evidence indicates that ambient ammonia concentrations throughout the upper SFE are not high enough to cause acute toxicity to delta smelt or to the wide range of aquatic organisms explicitly protected by current U.S. EPA ammonia criteria. This characterization of ambient conditions applies not only to "POD" years (2002 onward), but also to the entire 35-year period for which long-term monitoring data are available. The characterization also applies to the entire reach of the Sacramento River below the SRWTP discharge (e.g., River Mile 44 and points downstream).

The U.S. EPA acute criterion for ammonia that applies to water bodies with salmonids was specifically derived to protect rainbow trout. Because repeated rounds of testing indicate that delta smelt have similar acute sensitivity to ammonia as rainbow trout (Werner et al. (2008, 2009)),[14] the U.S. EPA acute criterion is appropriately considered protective of delta smelt.

[14] Werner, I., L.A. Deanovic, M. Stillway, and D. Markiewicz. 2008. *The Effects of Wastewater Treatment Effluent-Associated Contaminants on Delta Smelt*. Final Report to the Central Valley Regional Water Quality Control Board. September 26, 2008.

Werner, I., L.A. Deanovic, M. Stillway, and D. Markiewicz. 2009. *Acute toxicity of Ammonia/um and Wastewater Treatment Effluent-Associated Contaminant on Delta Smelt - 2009*. Final Report to the Central Valley Regional Water Quality Control Board. December 17, 2009.

Attachment K references two recent studies which indicate that ambient concentrations of ammonia throughout the estuary, including in the Sacramento River below the SRWTP, meet U.S. EPA ammonia criteria:

- Engle (2010)[15] compared U.S. EPA acute and chronic criteria with ambient ammonia concentrations from almost 12,000 grab samples taken throughout the freshwater and brackish estuary from 1974 to the present. The dataset included monitoring results from the IEP, USGS, DWR, USFWS, the District, and the UC Davis Aquatic Toxicology Lab. In this large dataset, ammonia concentrations *never* exceeded the U.S. EPA acute criterion; the chronic criterion was exceeded *only twice* in the available record (one sample each in 1976, 1991). Margins of safety were large: the chronic criterion exceeded ambient concentrations by average factors of 40 and 80, in the brackish and freshwater estuary, respectively.

- Regional Board staff conducted ambient water sampling at 21 sites in the freshwater Delta between March 2009-February 2010 (Foe et al. (2010)).[16] None of their measurements of ammonia exceeded the U.S. EPA acute or chronic criterion. In addition, Regional Board staff screened their ambient data using an ultra-conservative, hypothetical chronic criterion for delta smelt, which they created by using the highest of 3 Acute to Chronic Ratios (ACRs) (20.7, 9.7, 6.5) for fathead minnow contained in U.S. EPA (1999)[17]. Although such use of an ACR of 20.7 conflicts with the U.S. EPA interpretation of fathead minnow data[18], and although U.S. EPA does not use ACRs for single species to derive chronic criteria[19], the hypothetical chronic criterion so derived was not exceeded by any of the ambient concentrations measured in the Regional Board study.

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[15] Engle, D. (2010) Testimony before State Water Resources Control Board Delta Flow Informational Proceeding. Other Stressors-Water Quality: Ambient Ammonia Concentrations: Direct Toxicity and Indirect Effects on Food Web. Testimony submitted to the State Water Resources Control Board, February 16, 2010.

[16] Foe, C., A. Ballard, and S. Fong (2010) Nutrient Concentrations and Biological Effects in the Sacramento-San Joaquin Delta. Central Valley Regional Water Quality Control Board, July 2010.

[17] USEPA. 1999. *1999 Update of Ambient Water Quality Criteria for Ammonia*. EPA 822-R-99-014. United States Environmental Protection Agency, December 1999.

[18] U.S. EPA used the geometric mean of all three available ACRs (20.7, 9.7, 6.5) to characterize the acute:chronic sensitivity of fathead minnow (Pimephales), not the highest of the available ACRs (20.7). This was done because U.S. EPA considered the test that yielded the ACRs of 20.7 to be flawed (see U.S. EPA 1999 pp. 53-54). The resulting Genus Mean ACR (GMACR) for fathead minnow is 10.86.

[19] Five GMACRs for fish genera have survived vetting by the U.S. EPA and were published in both the 1999 (see reference above) and 2009 (U.S. EPA, Draft 2009 Update Aquatic Life Ambient Water quality Criteria for Ammonia – Freshwater. EAP-822-D-09-001. December 2009) U.S. EPA ammonia criteria documents (*Pimephales* - 10.86, *Catostomus* - <8.33, *Ictaluris* - 2.712, *Lepomis* - 7.671, *Micropterus* - 7.688). All five GMACRs are used by U.S. EPA in the derivation of the chronic ammonia criterion - not just the GMACR for fathead minnow.

In Attachment K, the Tentative Permit references an opinion expressed by Werner et al. (2008, 2009) that repeated excursions of pH above 8.0 in the Delta equate to a potential for chronic toxicity for delta smelt. This gross generalization is not evaluated using ambient data in Werner et al. (*ibid.*), and does not constitute a valid basis for inferring chronic toxicity in the estuary. Because total ammonia concentrations and water temperature vary widely within pH strata across the estuary, ambient pH alone is an inappropriate basis for gauging whether un-ionized ammonia concentrations are of concern. Plots of pH versus un-ionized ammonia for both the brackish estuary and the freshwater Delta for the years 2000-2010 (SRCSD (2010))[20] indicate that un-ionized ammonia concentrations span the full range of ambient values (low to high) when pH >8.0.

3. Hypothesized Benefits of Ammonia Reduction in Terms of Increased Diatom Biomass in Suisun Bay Are So Uncertain As to Make a Requirement for Full Nitrification Unreasonable

The Tentative Permit alleges that ammonium inhibition of nitrate uptake reduces the frequency of diatom blooms in Suisun Bay. The Tentative Permit provides no direct evidence regarding how often this alleged impact occurs, for how long, why it is a problem, how it affects the food web, or whether it affects fish species—all information needed to describe how it might impair the aquatic life beneficial use. Due to the overwhelming impact of benthic grazing by the invasive clam *Corbula amurensis* on phytoplankton biomass during the summer and fall in Suisun Bay (Alpine & Cloern 1992, Jassby et al. 2002, Kimmerer 2005, Thompson 2000)[21], no serious student of the upper SFE would expect a return of historic summer-fall phytoplankton biomass in the brackish Delta as long as the estuary remains colonized by *Corbula*—regardless of other physical or chemical changes that may occur in the estuary. Consequently, postulated dividends of increased diatom biomass related to ammonia reduction are logically currently constrained primarily to the April-May window, when lower benthic grazing rates, increased water temperature, increased thermal stratification, and other factors occasionally provide

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[20] Sacramento Regional County Sanitation District Comments on Draft "Nutrient Concentration and Biological Effects in the Sacramento-San Joaquin Delta, Central Valley Regional Water Quality Control Board, May 2010. Letter submitted to Chris Foe, Central Valley Regional Water Quality Control Board, June 14, 2010 (SRCSD (2010).)

[21] Alpine, A. E., and J. E. Cloern (1992) Trophic interactions and direct physical effects control phytoplankton biomass and production in an estuary. Limnol. Oceanogr. 37:946-955.

Jassby A.D., Cloern J.E., Cole B.E. (2002) Annual primary production: patterns and mechanisms of change in a nutrientrich tidal estuary. Limnol Oceanogr 47:698–712

Kimmerer W.J. (2005) Long-term changes in apparent uptake of silica in the San Francisco estuary. Limnol Oceanogr 50:793–798.

Thompson J.K. (2000) Two stories of phytoplankton control by bivalves in San Francisco Bay: the importance of spatial and temporal distribution of bivalves. J Shellfish Res 19:612.

windows for bloom development. However, what seems lost from Regional Board discussions about Suisun Bay is that—historically—*the spring period (Apr-May) was never when the bulk of annual phytoplankton biomass occurred in Suisun Bay*. Instead, prior to the arrival of the clam in 1987, June-September were the months of highest mean phytoplankton biomass in Suisun Bay and the confluence zone (SRCSD 2010, Figure 2). Consequently—even if ammonium reductions led to more frequent spring blooms in Suisun Bay—grazing by *Corbula* during summer and fall months will still prevent a recovery of annual algal biomass to levels that occurred in Suisun Bay in the 1970s and early 1980s.

Further, the Tentative Permit overstates the evidence provided by field surveys in Suisun Bay. The Tentative Permit implies that Wilkerson et al. (2006)[22] provides evidence that "ammonia-induced inhibition of nitrate uptake prevents spring algal blooms from developing when conditions are otherwise favorable." (Tentative Permit at p. K-5.) However, no time series data are presented in Wilkerson et al. (2006) regarding several environmental parameters (such as stratification, benthic grazing by clams, zooplankton abundance, residence time, Delta outflow), which could control whether or not conditions are "favorable" for blooms. In the time series of Wilkerson et al. (2006), algal blooms occurred only twice out of five periods when ammonium concentrations fell below 4 μM. This amply illustrates that other factors frequently prevent blooms in Suisun Bay even when ammonium concentrations are below the "Dugdale" threshold. In fact, because drawdown of ammonium has been documented by Wilkerson et al. during the onset of blooms, time series limited to measurements of ammonium and chlorophyll-a cannot rule out the possibility that low ammonium concentrations in situ are the *result* of a bloom triggered by non-nutrient factors, rather than the *cause*. The same methodological shortcomings apply to the recent field work funded by the San Francisco Regional Board, in which ammonia and chlorophyll-a were measured about twice per month during the spring/summer of 2010—work which is mentioned in the Tentative Permit and which has not been made available in a public report, but which was presented at the Bay-Delta Science Conference September 27-29, 2010.[23]

4. The Evidence Identified in the Tentative Permit Does Not Support That Ammonia Causes a Decrease in Chlorophyll-a or Changes the Phytoplankton Composition Downstream from the SRWTP

Despite the momentum that ammonium-inhibition has gained in the debate about ammonia's potential role in the Delta ecosystem, many dire predictions based on the ammonium-inhibition theory (and other ammonia/algae hypotheses) have been contradicted by results from recent studies funded by the Department of Water Resources (DWR), CalFed, the Regional Board, and

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[22] Wilkerson, F.R. Dugdale, V. Hogue, and A. Marchi, 2006. Phytoplankton blooms and nitrogen productivity in San Francisco Bay. Estuaries and Coasts 29(3):401-416.

[23] Marchi et al. (unpublished data presented on September 29, 2010).

the State Water Contractors. Unsubstantiated predictions include (1) chlorophyll-a production would be lower and slower in river water below the discharge, compared to above the discharge, (2) the SRWTP discharge would trigger a change in the relative biomass of large (diatom) phytoplankton in the Sacramento River, (3) biomass of phytoplankton would not increase in the river in reaches where ammonium uptake exceeded nitrate uptake, and (4) ammonia concentrations would explain the occurrence of *Microcystis*. In addition, in Attachment K, the Tentative Permit does not place ammonia-related hypotheses in context with other well-regarded hypotheses for recent changes in the biomass or composition of phytoplankton in the upper estuary. Evidence that contradicts the predictions include the following:

- During 4-6-day experiments by Parker et al. (2010)[24], phytoplankton grew better in water collected at RM-44 below the SRWTP discharge than they did in water collected above the discharge, despite the fact that ammonium concentrations at RM-44 were well above the "Dugdale threshold" of 4 μM[25]. Although the detailed time courses for these "grow out" experiments (Nov. 2008, and March and May 2009), were not included in Parker et al. (2010) Final Report to the Regional Board, several were included in Parker's oral presentation at the Regional Board Ammonia Summit (slides 9-10 in Parker et al. 2009)[26]. In all three months, phytoplankton growth was not delayed in water from RM-44 and there was more chlorophyll-a at the end of the experiments in water from RM-44 than in water collected above the discharge. These results led Parker et al. (2010) to paint a picture of *nitrogen-limited phytoplankton* upstream from the SRWTP, which potentially benefit from the ammonia introduced at the discharge.

> *Results from experimental grow-outs suggest that after removing light limitation phytoplankton bloom magnitude in the Sacramento River at RM-44 (downstream of SRWTP discharge) and GRC (upstream of SRWTP discharge) is likely determined by dissolved inorganic nitrogen (DIN) availability. Grow-out experiments conducted at RM-44 produced more chlorophyll-a than experimental grow-outs conducted at GRC. Phytoplankton appeared to take advantage of additional DIN, whether supplied as NO3 or NH4 in experiments conducted with water from GRC,*

[24] Parker, A.E., A. M. Marchi, J. Davidson-Drexel, R.C. Dugdale, and F.P. Wilkerson. 2010. Effect of ammonium and wastewater effluent on riverine phytoplankton in the Sacramento River, CA. Final Report. Technical Report for the California State Water Resources Board, May 29, 2010.

[25] Ammonium concentrations in RM-44 water used in the grow-out experiments were: July 2008 - 9.06 μM; November 2008 - 71.87 μM; March 2009 - 12.47 μM; May 2009 - 9.54 μM (Table 19-22 in Parker et al. (2010).

[26] Parker A.E., R.C. Dugdale, F.P. Wilkerson, A. Marchi, J.Davidson-Drexel, S. Blaser, and J. Fuller. 2009. Effect of wastewater treatment plant effluent on algal productivity in the Sacramento River Part 1: Grow-out and wastewater effluent addition experiments. Central Valley Regional Water Quality Control Board Ammonia Summit, Sacramento, California, August 18-19, 2009.

> *or in the form of NH4 supplied in the wastewater effluent (at RM-44) to produce greater biomass.* (Parker et al. 2010, p. 26.)

- The SRWTP discharge does not explain the longitudinal decrease in phytoplankton biomass and primary production rates *which starts above the discharge* in the Sacramento River and extends downstream past the discharge. Multiple longitudinal transects measuring nutrients and algal biomass in the Sacramento River from above Sacramento (I-80 bridge) to Suisun Bay were conducted by Regional Board staff (Foe et al. (2010))[27] and Parker et al. (2010))[28] in 2008-2009. Both studies revealed that although chlorophyll-a consistently declined in the downstream direction from the I-80 above Sacramento to Rio Vista, no step decline was associated with the SRWTP discharge. In addition, the Parker et al. study indicated that the SRWTP discharge did not differentially affect small (<5 μm) versus larger (>5 μm) phytoplankton, the latter considered a proxy for diatoms.

- The Tentative Permit acknowledges that factors unrelated to the SRWTP discharge are needed to explain declines in chlorophyll-a (and other indices of phytoplankton biomass) which were observed between the Yolo/Sacramento County line and the Rio Vista locale during the 2008-2009 field studies.

> *The decrease in chlorophyll a appears to commence above the SRWTP. The average annual decline in pigment between Tower Bridge in the City of Sacramento and Isleton is about 60 percent. The cause of the decline is not known, but has been variously attributed to algal settling, toxicity from an unknown chemical in the SRWTP effluent, or from ammonia. The SRWTP discharge cannot be [the] cause of pigment decline upstream of the discharge point, and may not be contributing to the decline downstream of the discharge point.* (Tentative Permit, p. K-6.)

- Longitudinal transects by the Parker/Dugdale team during their 2008-2009 Sacramento River project included rate measurements (uptake of carbon, ammonia and nitrate) at 21 stations from I-80 above Sacramento downstream into Suisun Bay (see Attachment 4 in Engle Testimony (2010)[29]. These rate measurements, which were not included in the

[27] Foe, C., A. Ballard, and S. Fong. 2010. Nutrient concentrations and biological effects in the Sacramento-San Joaquin Delta. Central Valley Regional Water Quality Control Board, Final Report, July 2010.

[28] Parker, A.E., A. M. Marchi, J. Davidson-Drexel, R.C. Dugdale, and F.P. Wilkerson. 2010. Effect of ammonium and wastewater effluent on riverine phytoplankton in the Sacramento River, CA. Final Report. Technical Report for the California State Water Resources Board, May 29, 2010.

[29] Engle, D. (2010) Testimony before State Water Resources Control Board Delta Flow Informational Proceeding. Other Stressors-Water Quality: Ambient Ammonia Concentrations: Direct Toxicity and Indirect Effects on Food Web. Testimony submitted to the State Water Resources Control Board, February 16, 2010.

Parker et al. (2010) report to the Regional Board[30], show that primary production rates were not explained by relative rates of ammonium- versus nitrate uptake.

- No step-change in phytoplankton biomass or carbon fixation rates was associated with either (1) the location of the SRWTP discharge, or (2) the shift from primarily nitrate uptake by phytoplankton to primarily ammonia uptake below the discharge. Carbon fixation rates decreased *starting upstream* of the SRWTP, despite the fact that nitrate dominated N uptake in that reach of the river.

- Significant *increases* in phytoplankton concentration (chlorophyll-a) and carbon fixation occurred between Rio Vista and Suisun Bay, although inorganic nitrogen uptake was dominated by ammonium in that reach.

- Attachment K implies that *Microcystis* is a "less desirable form" of algae that may be associated with ammonia from the SRWTP. However, available research from the Delta —which is not referenced in the Tentative Permit—argues against a simplistic association between *Microcystis* and nutrient form or concentration. Studies conducted by Lehman et al. (2008, 2010)[31] and Mioni (2010)[32] in the Delta have found no apparent association between ammonium concentrations or NH_4^+:P ratios and either *Microcystis* abundance or toxicity. Instead, it appears from these studies that water temperature is strongly positively correlated with *Microcystis* abundance and toxicity and that water transparency, flows, and specific conductivity are also potential drivers of *Microcystis* blooms in the Delta. An association between water temperature and *Microcystis* blooms in the Delta is supported by the upward trend in spring-summer mean water temperature in the freshwater Delta between 1996-2005 (Jassby (2008))[33] and would be consistent with observations from other estuaries, where increased residence time (e.g., during drought) and warmer temperatures are acknowledged as factors stimulating

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[30] Some results of the longer Sacramento River transects were presented in a poster: Parker, A.E., R.C. Dugdale, F.P. Wilkerson, A. Marchi, J. Davidson-Drexel, J. Fuller, and S. Blaser. 2009. *Transport and Fate of Ammmonium Supply from a Major Urban Wastewater Treatment Facility in the Sacramento River, CA*. 9th Biennial State of the San Francisco Estuary Conference, Oakland, CA, September 29-October 1, 2009.

[31] Lehman, P.W., G. Boyer, M. Satchwell, and S. Waller. 2008. The influence of environmental conditions on the seasonal variation of *Microcystis* cell density and microcystins concentration in the San Francisco Estuary. Hydrobiologia 600:187-204.

Lehman, P.W., S.J. Teh, G.L. Boyer, M.L. Nobriga, E. Bass, and C. Hogle. 2010. Initial impacts of *Microcystis aeruginosa* blooms on the aquatic food web in the San Francisco Estuary. Hydrobiologia 637:229-248.

[32] Mioni, C.E., and A. Paytan. 2010. *What controls Microcystis bloom & toxicity in the San Francisco Estuary? (Summer/Fall 2008 & 2009)*. Delta Science Program Brownbag Series, Sacramento, CA. May 12, 2010.

[33] Jassby, A. 2008. Phytoplankton in the Upper San Francisco Estuary: recent biomass trends, their causes and their trophic significance. San Francisco Estuary & Watershed Science, Feb. 2008.

cyanobacterial blooms (Pearl et al. (2009), Pearl & Huisman (2008), Fernald et al. (2007)).[34]

- The Tentative Permit omits information that *physical factors* (such as temperature, current speed, residence time, turbulent mixing, stratification, light penetration) may be strongly affecting competitive outcomes between diatoms and other phytoplankton taxa in the Delta. The influence of flows and residence time on phytoplankton assemblages in estuaries is well-acknowledged in other regions. For example, hydrologic perturbations, such as droughts, floods, and storm-related deep mixing events, overwhelm nutrient controls on phytoplankton composition in the Chesapeake Bay; diatoms are favored during years of high discharge and short residence time (Pearl et al. (2006)).[35] The role of flow and residence time in regulating estuarine microfloral composition was summarized by the expert panel convened by CalFed in March 2009 in their final "*Ammonia Framework"* document:

> *Diatoms have fast growth rates and may be particularly good competitors during high flows with concomitant short residence times, when their fast growth rates can offset high flushing rates. In moderate flows, chlorophytes and cryptophytes become more competitive, whereas low flows with concomitant longer residence times allow the slower-growing cyanobacteria, non-nuisance picoplankton, and dinoflagellates to contribute larger percentages of the community biomass. These spatially and temporally-variable patterns of phytoplankton composition are typical of many estuaries [e.g., Chesapeake Bay, Maryland; Neuse-Pamlico Sound, North Carolina; Narragansett Bay, Rhode Island; Delaware Bay, Delaware]*. (Meyer et al. (2009).)[36]

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[34] Pearl, H.W., K.L. Rossignol, S. Nathan Hall, B.L. Peierls, and M.S. Wetz. 2009. Phytoplankton community indicators of short- and long-term ecological change in the anthropogenically and climatically impacted Neuse River Estuary, North Carolina, USA. Estuaries and Coasts. DOI 10.1007/s12237-009-9137-0.

Paerl, H.W., and J. Huisman. 2008. Blooms like it hot. Science 320:57–58. doi:10.1126/science.1155398.

Fernald, S.H., N.F. Caraco, and J. J. Cole. 2007. Changes in cyanobacterial dominance following the invasion of the zebra mussel *Dreissena polymorpha*: long-term results from the Hudson River Estuary. Estuaries and Coasts 30:163-170.

[35] Pearl, H.W., L.M. Valdes, B.L. Peierls, J.E. Adolf, and L.W. Harding, Jr. 2006. Anthropogenic and climatic influences on the eutrophication of large estuarine ecosystems. Limnol. Oceanogr. 51(1, part 2):448-462.

[36] Meyer, J.S., P.J. Mulholland, H.W. Paerl, and A.K. Ward. 2009. A framework for research addressing the role of ammonia/ammonium in the Sacramento-San Joaquin Delta and the San Francisco Bay Estuary Ecosystem. Final report submitted to CalFed Science Program, Sacramento, CA, April 13, 2009.

The idea that flows influence diatom abundance is not new in the Delta. Lehman (1996, 2000)[37] associated a multi-decadal decrease in the proportional biomass of diatoms in the Delta and Suisun Bay to climatic influences on river flow. The Regional Board recently found that current speed in the Sacramento River was related to the difference in phytoplankton biomass between Freeport and Isleton (Foe et al. (2010))[38].

- Top-down effects on phytoplankton composition - caused by selective grazing by clams and zooplankton - are not acknowledged in the Tentative Permit, but are likely to influence the species composition of phytoplankton in the SFE, and may contribute to the occurrence of *Microcystis*. Clam grazing selectively removes larger particles from the water column (Werner & Hollibaugh (1993))[39]; clams may consume a larger fraction of diatoms than smaller plankton taxa such as flagellates. Kimmerer (2005)[40] attributed a step decrease in annual silica uptake after 1986 to efficient removal of diatoms by *Corbula amurensis* after its introduction in 1986. Grazing by *Corbicula fluminea* can cause shallow habitats in the freshwater Delta to serve as a net sink for phytoplankton (Lopez et al. (2006), Parchaso & Thompson (2008))[41]; it is possible that diatoms are differentially affected by benthic grazing (e.g., compared to motile or buoyant taxa) in both the brackish and freshwater Delta. Significantly, benthic grazing has been implicated as a factor favoring *Microcystis* over other phytoplankton, as explained in the CalFed expert panel's "*Ammonia Framework:"*

> *However, in places where filter-feeding mussels and clams overlap with habitat suitable for Microcystis (i.e., low salinity), the presence of these invertebrates might enhance bloom formation by selectively rejecting*

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[37] Lehman, P.W. 1996. Changes in chlorophyll-a concentration and phytoplankton community composition with water-year type in the upper San Francisco Estuary. (pp. 351-374) In Hollibaugh, J.T, (ed.) San Francisco Bay: the ecosystem. San Francisco (California): Pacific Division, American Association for the Advancement of Science.

Lehman, P.W. 2000. The influence of climate on phytoplankton community biomass in San Francisco Bay Estuary. Limnol. Oceanogr. 45:580-590.

[38] Foe, C., A. Ballard, and S. Fong. 2010. Nutrient concentrations and biological effects in the Sacramento-San Joaquin Delta. Central Valley Regional Water Quality Control Board, Final Report, July 2010.

[39] Werner, I., and J.T. Hollibaugh. 1993. *Potamocorbula amurensis*: Comparison of clearance rates and assimilation efficiencies for phytoplankton and bacterioplankton. Limnol. Oceanogr. 38:949-964.

[40] Kimmerer, W.J. 2005. Long-term changes in apparent uptake of silica in the San Francisco Estuary. Limnol. Oceanogr. 50:793-798.

[41] Lopez, C.B., J.E. Cloern, T.S. Shraga, A.J. Little, L.V. Lucas, J.K. Thompson, and J. R. Burau. 2006. Ecological values of shallow-water habitats: implications for the restoration of disturbed ecosystems. Ecosystems 9:422-440.

Parchaso F., and J. Thompson. 2008. *Corbicula fluminea* distribution and biomass response to hydrology and food: A model for CASCaDE scenarios of change. CalFed Science Conference, Sacramento, CA. October 2008. Avail at http://cascade.wr.usgs.gov/CalFed2008.shtm

> *large Microcystis colonies. That grazer selectivity can give Microcystis a grazer-resistant, competitive advantage over other phytoplankton, as Vanderploeg et al. (2001) reported for zebra mussels (Dreissena polymorpha) in the Great Lakes.* (Meyer et al. (2009).)[42]

In addition to mussels and clams, grazing by zooplankton can exert a top-down effect on phytoplankton composition; the literature regarding selective feeding by zooplankton is impractical to review herein. However, in a particularly pertinent example, selective grazing by the Delta copepod *P. forbesi* was recently demonstrated as a viable mechanism for promoting *Microcystis* blooms (Ger et al. (2010)).[43]

- The Tentative Permit echoes a hypothesis advanced in (Glibert 2010) that changes in N:P or ammonia:nitrate ratios are responsible for the observed shift in the Delta phytoplankton community from an assemblage historically dominated by diatoms to one that is now dominated by flagellates and blue-green algae. Unfortunately, Glibert's conclusions are not based on direct experimental evidence of differential phytoplankton responses to nutrient ratios in the San Francisco Estuary (SFE). Instead, Glibert arrives at her conclusions using an improperly applied statistical transformation (cumulative sums of variability, or CUSUM) to produce artificial correlations between nutrient parameters and biological parameters (phytoplankton, zooplankton, fish abundance). Glibert's approach was analytically and conceptually flawed, as detailed in Engle & Suverkropp (2010):[44]

> The correlation approach used by Glibert (using CUSUM values instead of measured values) violated assumptions for linear regression, and can produce spurious relationships between variables that are unsupported by the underlying data. Although she analyzed chemical and plankton data from only one station in the freshwater Delta (Sacramento River at Hood), and two stations in Suisun Bay, Glibert generalizes her results to the whole of the upper San Francisco Estuary SFE. Although they are not well articulated in the article, a number of problematic ecological

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[42] Meyer, J.S., P.J. Mulholland, H.W. Paerl, and A.K. Ward. 2009. *A Framework for Research Addressing the Role of Ammonia/Ammonium in the Sacramento-San Joaquin Delta and the San Francisco Bay Estuary Ecosystem*. Final report submitted to CalFed Science Program, Sacramento, CA. April 13, 2009.

[43] Ger, K.A., P. Arneson, C.R. Goldman, and S.J.Teh. 2010. Species specific differences in the ingestion of *Microcystis* cells by the calanoid copepods *Eurytemora affinis* and *Pseudodiaptomus forbesi*. Short Communication. J. Plankton Research. doi: 10.1093/plankt/fbq071.

[44] Engle, D. and C. Suverkropp. 2010. Memorandum: Comments for Consideration by the State Water Resources Control Board Regarding the Scientific Article *Long-term Changes in Nutrient Loading and Stoichiometry and their Relationships with Changes in the Food Web and Dominant Pelagic Fish Species in the San Francisco Estuary, California* by Patricia Glibert. 17 pp. July 29, 2010.

> assumptions are required to infer cause and effect from her correlation analysis. Key analyses that are necessary to support her conceptual model are missing from the publication. Many well-known alternative hypotheses for the observed changes in plankton composition and fish abundance in the SFE (and in estuaries, generally)—which would have been testable using her CUSUM methodology—were omitted from the analysis and from discussion in the article. Finally, owing to the peculiarity of the CUSUM transformation, it is likely that a wide variety of non-nutrient environmental factors (essentially any factors which have trended over time in the SFE in concert with changes in fish abundance) could be shown as highly correlated with pelagic fish abundance using CUSUM correlations. As an example included in Section 1 of this memo, it is shown that when subjected to the same analysis used in Glibert's paper, annual water exports perform as well as ammonia concentrations in explaining trends in the summertime abundance of Delta smelt. (Engle & Suverkropp (2010).)

After referencing Glibert's (2010)[45] hypothesis regarding bottom-up effects on algal composition, the Tentative Permit acknowledges "*whether this [shift in algal communities] is the result of changes in nutrient concentrations and/or ratios is not known*." (Attachment K at p. K-7.) Attachment K additionally acknowledges that additional studies are in fact necessary to determine if nutrient control would actually "*cause the community to revert back to diatom-based system*."

5. The Tentative Permit Does Not Present Evidence That a Shift in Phytoplankton Composition in the Estuary Represents a Degradation of Food Resources at the Bottom of the Food Web

The Tentative Permit references a shift in phytoplankton composition that has been observed in the upper SFE (the brackish and freshwater Delta), characterized by a decline in the relative abundance of diatoms and an increase in other taxa including flagellates, green algae, and cyanobacteria. A required assumption for linking ammonium inhibition to the POD is that these changes in phytoplankton composition signal a deterioration in the quality of food for estuarine mesozooplankton, and calanoid copepods in particular, that may have repercussions for pelagic fish which eat them. For example, the Tentative Permit parrots a common claim that large diatoms are better food for SFE zooplankton than other classes or sizes of phytoplankton. However, there is no direct evidence in the Tentative Permit to support this supposition. In fact, with the exception of the recent occurrence of the toxic alga *Microcystis*, there is currently little

[45] Glibert, Patricia M. Long-term Changes in Nutrient Loading and Stoichiometry and Their Relationship with Changes in the Food Web and Dominant Pelagic Fish Species in the San Francisco Bay Estuary, California.

basis for the assumption that the observed shift in phytoplankton composition is a negative development for the key copepods which are prey for POD fishes, or for other zooplankton in the estuary. At least six lines of evidence challenge the simplistic diatom -> copepod -> fish "paradigm" that is used to justify much of the attention regarding ammonia and the SFE food web:

1. Feeding experiments conducted in the SFE indicate that the principal calanoid copepods in the estuary (*Acartia* spp., *E. affinis*, *P. forbesi*) prefer motile prey over non-motile prey, and prefer heterotrophic prey (e.g., cilliates, heterotrophic dinoflagellates) over phytoplankton (Bollens & Penry (2003)[46], Bouley & Kimmmer (2006), Gifford et al. (2007))[47]. In other words, these copepods do not rely on diatoms—or even on phytoplankton—as a direct food source, and frequently discriminate against phytoplankton altogether (even during diatom blooms) depending on season and location in the estuary.

2. The reproductive implications of food choices is virtually unstudied for the copepods of the SFE. For example, a recent review of almost 400 research articles revealed that only three published studies measured egg production or hatching success for SFE-pertinent copepod species fed mixtures of diatoms and non-diatoms (Engle Slides (2010))[48]. In other words, there is essentially no direct evidence that changes in phytoplankton composition in the estuary have population-level consequences for copepods.

3. Non-diatom classes of phytoplankton include species which are considered highly nutritious for zooplankton. Examples are the cryptophytes (which include *Cryptomonas* and *Rhodomonas* spp.) and *Scenedesmus* spp. (a green alage), which are both used to rear zooplankton in laboratories.

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[46] Bollens, Gretchn C. Rollwagen, Penry, Deborah L. Feeding dynamics of *Acartia* spp. copepods in a large, temperate estuary (San Francisco Bay, CA).

[47] Bouley, P. & Kimmerer, W. J. (2006) Ecology of a highly abundant, introduced cyclopoid copepod in a temperate estuary. *Marine Ecology-Progress Series,* **324,** 219-228.

Gifford, S. M., Rollwagen-Bollens, G. & Bollens, S. M. (2007) Mesozooplankton omnivory in the upper San Francisco estuary. *Marine Ecology-Progress Series,* **348,** 33-46.

[48] Engle, D. (2010) Slides and Oral Remarks Presented in: *Engle, D. (2010) How well do we understand the feeding ecology of estuarine mesozooplankton? A survey of the direct evidence*. 6th Biennial Bay-Delta Science Conference, Sacramento, CA, September 27-29, 2010, 31 pp.

4. The Tentative Permit does not acknowledge that a large body of literature exists indicating that direct feeding on diatoms can cause reproductive failure in copepods (see Ianora & Miralto (2010), and references therein)[49]. This potential harmful effect of diatoms on copepods, first described in the early 1990s, prompted a re-evaluation of the classic paradigm that "diatoms-beget-copepods-beget-fish" that continues today. There are at least 24 recent experiments indicating harmful effects of diatom grazing for copepod species pertinent to the SFE (i.e., SFE species and their cofamilials; Engle Slides (2010)[50]).

5. Chlorophyll-a levels below 10 µg/L are frequently cited as evidence that zooplankton in the Delta are food limited (Muller-Solger et al. (2002))[51]. However, this threshold is based on growth experiments conducted with a single cladoceran zooplankton species (*Daphnia magna*) and it is unclear whether this threshold is appropriately applied to copepods in this system.

6. The heavy reliance of SFE copepods on non-algal foods indicates that detritus-based pathways for energy transfer may contribute more to the pelagic food web in the Delta than has been acknowledged. Such information led the IEP to make the following acknowledgement in its 2007 Synthesis of Results:

> . . . it is possible that the hypothesis that the San Francisco Estuary is driven by phytoplankton production rather than through detrital pathways may have been accepted too strictly. (Baxter et al. (2008))[52]

[49] Ianora, A. & Miralto (2010) A. Toxigenic effects of diatoms on grazers, phytoplankton and other microbes: a review. *Ecotoxicology,* **19,** 493-511.

[50] Engle, D. (2010) Slides and Oral Remarks Presented in: *Engle, D. (2010) How well do we understand the feeding ecology of estuarine mesozooplankton? A survey of the direct evidence*. 6th Biennial Bay-Delta Science Conference, Sacramento, CA, September 27-29, 2010, 31 pp.

[51] Müller-Solger, A.B., A.D. Jassby, and D. C. Müller-Navarra. 2002. Nutritional quality of food resources for zooplankton (*Daphnia*) in a tidal freshwater system (Sacramento-San Joaquin River Delta). Limnol. Oceanogr. 47:1468-1476.

[52] Baxter, R., R. Breuer, L. Brown, M. Chotkowski, F. Feyrer, M. Gingras, B. Herbold, A. Müller-Solger, M. Nobriga, T. Sommer, and K. Souza. 2008. Pelagic organism decline progress report: 2007 Synthesis of results. Interagency Ecological Program for the San Francisco Estuary.

6. The Copepod Toxicity Tests Referenced in the Tentative Permit Are an Improper Basis for Requiring Full Nitrification

The Tentative Permit relies on an oral presentation by Teh et al. (2009)[53], given at the Regional Board's Ammonia Summit, regarding acute toxicity tests with the copepods *Eurytemora affinis* and *Pseudodiaptomus forbesi* to allege that the U.S. EPA acute criterion for ammonia may not be protective of these invertebrates. However, none of the LC50s reported in Teh et al. (2009) for either copepod species exceeded the U.S. EPA acute criterion for ammonia.[54] Furthermore, the data referenced in the 2009 oral presentation for *P. forbesi* have never appeared in a draft or final report, and consequently have not been subject to stakeholder or peer review.

Attachment K implies that an "ACR analysis" included by Teh in his 2009 oral presentation provides an indication of potential ambient chronic toxicity for copepods. (Tentative Permit at p. K-2.) In Teh's ACR approach, the LC50s from his lowest test pH (7.2) were divided by a mean ACR from U.S. EPA (1999) to yield a hypothetical chronic criterion for the 2 copepod species. However, as explained in Engle Memorandum (2010)[55], use of the lowest test pH (which was not representative of ambient pH in the brackish or freshwater Delta) biased the analysis. When the LC50s from exposures at *environmentally relevant* test pH (7.6)[56] are used in an analogous ACR analysis, the resulting hypothetical chronic criteria for the two copepod species was exceeded by only 4 out of 2487 measurements of un-ionized ammonia from the upper SFE during the last decade (Engle Memorandum (2010)).[57]

Allegations based on Teh et al. (2009) that Sacramento River water below the discharge contains ammonium concentrations that can cause mortality to either *E. affinis and P. forbesi* rely on test results using misrepresentative pH. Regarding the experiments described by Teh et al. (2009), the Tentative Permit mentions that ten percent mortality occurred to both *E. affinis* and *P. forbesi* at ambient concentrations present in the river below the SRWTP. By doing so, the Tentative

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[53] Teh, S., S. Lesmeister, I. Flores, M. Kawaguchi, and C. Teh. 2009a. *Acute Toxicity of Ammonia, Copper, and Pesticides to Eurytemora affinis and Pseudodiaptomus forbesi.* Central Valley Regional Water Quality Control Board Ammonia Summit, Sacramento, California, August 18-19, 2009.

[54] In Teh et al. (2009) LC50s (as total ammonia) for *E. affinis* ranged 7.56-10.97 mg N/L and for *P. forbesi* ranged 5.87-7.68 mg N/L [ranges reflect tests at different pH]; the USEPA acute criterion is 11.4 mg N/L at the representative pH 7.6.

[55] Engle, D. (2010) Memorandum: Comments Regarding the Regional Board Staff Analysis of the 2009 Ammonia Summit. 20 pp. January 13, 2010.

[56] Based on IEP, USGS, and DWR monitoring data for the period 2000-2010, the median and mean pH for the brackish delta are 7.6 and 7.7, respectively, and the median and mean pH for the freshwater Delta were both 7.6 (Engle 2010).

[57] Engle, D. (2010) Memorandum: Comments Regarding the Regional Board Staff Analysis of the 2009 Ammonia Summit. 20 pp. January 13, 2010.

Permit disregards qualification of these particular results in the Regional Board staff's Summary of the Ammonia Summit. In this summary, Foe (2009)[58] acknowledged that the test pH associated with toxicity in Dr. Teh's experiments (7.2) was not representative of ambient pH levels in the Sacramento River:

> *Ten percent mortality occurred to both species at ambient ammonia concentrations present in the river below the SRWTP. However, toxicity was only observed at a lower pH (7.2) than commonly occurs in the River (7.4 to 7.8). Toxicity was not observed when toxicity testing was done at higher pH levels.* (Foe (2009), p. 2.)

When environmentally representative pH is considered, test results using *E. affinis* do not indicate a potential for acute toxicity in the Sacramento River or the Delta. Acute tests with *E. affinis* referenced in the Teh et al. (2009) oral presentation were described as Appendix A in a progress report for the UC Davis POD project (Reece et al. (2009))[59] and again as chapter IV.3 in Werner et al. (2010)[60]. The LC10[61] for *E. affinis* obtained at the most environmentally relevant test pH used (pH 7.6) was 5.0 mg N/L total ammonia. This concentration (5.0 mg N/L) is about five times higher than the maximum concentrations observed in the Sacramento River from RM-44 and points downstream. This LC10 is higher than the 99.91-% percentile of ammonia concentrations occurring 350 feet below the SRWTP diffuser[62]. *In other words, ambient concentrations of total ammonia in the Sacramento River essentially never exceed the lowest acute thresholds (LC10) thus far reported for E. affinis for representative pH conditions*. The lack of reasonable potential for acute toxicity for *E. affinis* for the rest of the Delta is reflected by long-term monitoring data; in terms of *un-ionized* ammonia, the LC10 for representative pH 7.6 (0.08 mg N/L un-ionized ammonia) is well above the 99th percentile for freshwater concentrations of un-ionized ammonia in the freshwater Delta for 2000-2010 (0.014 mg N/L un-ionized ammonia, Engle Testimony (2010))[63].

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[58] Foe, C. 2009. *August 2009 Ammonia Summit Summary*. Technical Memo to Jerry Bruns and Sue McConnell, Central Valley Regional Water Quality Control Board, 24 September 2009.

[59] Reece, C., D. Markiewicz, L. Deanovic, R. Connon, S. Beggel, M. Stillway, and I. Werner. 2009. *Pelagic Organism Decline (POD): Acute and Chronic Invertebrate and Fish Toxicity Testing in the Sacramento-San Joaquin Delt*a. UC Davis Aquatic Toxicology Laboratory, Progress Report, 29 September 2009.

[60] Werner, I., et al. Pelagic Organism Decline (POD): Acute and Chronic Invertebrate and Fish Toxicity Testing in the Sacramento-San Joaquin Delta 2008-2010. (Final Report (July 24, 2010).)

[61] LC10 is the concentration at which it is estimated there is 10% mortality.

[62] Larry Walker Associates, 2009 Anti-Degradation Analysis for Proposed Discharge Modification to the Sacramento Regional Wastewater Treatment Plant, DRAFT; prepared for Sacramento Regional County Sanitation District, May 2009.

[63] Engle, D. (2010) Testimony before State Water Resources Control Board Delta Flow Informational Proceeding. Other Stressors-Water Quality: Ambient Ammonia Concentrations: Direct Toxicity and Indirect Effects on Food Web. Testimony submitted to the State Water Resources Control Board, February 16, 2010.

The Tentative Permit relies on another oral presentation (Teh et al. (2010)) to infer that ambient concentrations of total ammonia in the Sacramento River potentially cause chronic toxicity to *P. forbesi*. (Tentative Permit at p. K-2.) The oral presentation described the results of preliminary chronic tests (30-day full life cycle tests) using *P. forbesi*, conducted during the summer 2010. In the Tentative Permit, the lowest test concentration from this experiment (0.36 mg N/L total ammonia) is included in the rationale for denying a 60 foot acute and 350 foot chronic mixing zone for ammonia. The exaggerated significance on this experimental outcome is inappropriate for several reasons:

- The test result concentration (0.36 mg/L) does not represent an EC20 for the species. EC20s are the thresholds used by the U.S. EPA (2009) for derivation of the chronic ammonia criterion.

- The concentration referenced in Attachment K (0.36 mg/L total ammonia) is from weeks-old laboratory work that has not been presented in written form for stakeholder or peer review.

- The tests were conducted with a novel test organism (a copepod species), for which there are no established protocols and no comparable test results from other laboratories.

- There were irregularities, for which the investigators have no explanation, in the test results (the fact that an inverse relationship was observed between toxicity and test pH, which is opposite from the expected responses for organisms included in the U.S. EPA ammonia database).

Finally, by treating a test concentration from the preliminary work with *P. forbesi* as if it were an established, chronic endpoint for the species, the Tentative Permit contradicts its own evaluation of the state of knowledge regarding copepod sensitivity to ammonia:

> *Toxicity impacts from ammonia to more sensitive aquatic life, such as copepods, are continuing to be evaluated and* ***current findings need to be confirmed before the information can be used to determine that beneficial uses are impacted***. (Tentative Permit Options at p. 6, emphasis added.)

B. Partial Nitrification (as Described in Alternatives #2 or #3 with Ultimate Oxygen Demand (UOD) Limits) Has Not Been Adequately Considered

1. Partial Nitrification Would Reduce Ambient Ammonia Concentrations

The Tentative Permit fails to address or consider whether one or more of the partial nitrification alternatives considered in the Tentative Permit may in fact address concerns in Suisun Bay cited in the Tentative Permit that arise from the Dugdale hypothesis regarding ammonia inhibition of

nitrate uptake. The partial nitrification alternatives are listed in the document prepared by Regional Board staff that accompanies the Tentative Permit that is titled, "Tentative NPDES Permitting Options."

Under the Dugdale hypothesis, the theory is that ammonia concentrations over a certain threshold level prevent the onset of phytoplankton blooms under occasional conditions of low turbidity and low grazing pressure from invasive clams. Under this hypothesis, the ammonia inhibition occurs when ambient ammonia levels exceed an approximate threshold of 0.056 mg/L. If ammonia levels drop below that threshold, phytoplankton blooms can initiate which act to deplete ammonia levels, followed by fairly rapid utilization of available nitrate, which is present in greater supply than ammonia and provides the energy for large-scale phytoplankton blooms.

The Tentative Permit argues that full nitrification of the SRWTP effluent is required to prevent ammonia inhibition from occurring in Suisun Bay, as described by the Dugdale hypothesis. However, simple calculations based on available information show that Alternatives 2 and 3 (the partial nitrification alternatives that would result in more than a 50% reduction in the SRWTP effluent ammonia loads) would cause a drop in ambient ammonia levels in Suisun Bay below the Dugdale threshold. Based on the USGS San Francisco Bay Water Quality Program data[64], the calculated values supporting this statement are summarized in Table II.1.

Table II.1. Lumped Water Year Average Ammonia Conditions in Suisun Bay before and after 1987.

Period	*Average Ammonia (mg/L as N)*
Pre 1987[(1)]	*0.052*
Post 1987[(1)]	*0.102*
Reduction to pre 1987 conditions	*49.1%*
With LDOPA[(1)]	*0.05*

[(1)] Average of data collected by the USGS Water Quality of San Francisco Bay Program.
[(2)] LDOPA requires approximately 50% reduction in SRWTP effluent ammonia. Assuming a linear response in Suisun Bay ammonia levels to reduced SRWTP effluent ammonia.

Setting aside the uncertainty regarding the impact of SRWTP ammonia on phytoplankton or diatoms in Suisun Bay and the validity or importance of the Dugdale theory, the concern for SRWTP ammonia effects in Suisun Bay may be rendered moot through implementation of Alternative 2 or 3, which will be required to address dissolved oxygen objective compliance

[64] http://sfbay.wr.usgs.gov/access/wqdata/.

issues in the Lower Sacramento River in future critical years. (See below.) The District has supported and continues to support implementation of these partial nitrification alternatives in the NPDES permit.

2. The District's Low Dissolved Oxygen Prevention Assessment (LDOPA) Report Properly Sets Forth UOD Limits for Protection of Beneficial Uses

Attachment K provides an adequate description of the District's Low Dissolved Oxygen Prevention Assessment (LDOPA (2010)), which includes development of an expanded Streeter-Phelps model used to determine the allowable loading of oxygen demanding substances in the SRWTP effluent that would ensure compliance with the dissolved oxygen Basin Plan water quality objective of 7.0 mg/L at any time downstream of discharges from the SRWTP. As discussed at length in the LDOPA report, because the dissolved oxygen objective is being evaluated in the river downstream of the discharge, the total oxygen demand, or UOD, of the SRWTP effluent is the proper parameter to limit to ensure compliance with the Basin Plan objective. The LDOPA model was used to demonstrate the strong seasonality of the dissolved oxygen in the Sacramento River. (LDOPA (2010).) Generally, when water temperatures are cooler, the dissolved oxygen concentrations are higher, and as river flow rates increase there is less change in dissolved oxygen for a given effluent condition. (LDOPA (2010).) Due to the strong seasonality of the dissolved oxygen in the Sacramento River, the LDOPA model was run using current UOD effluent concentrations for the months of November through April, the Wet Season, and any reductions from current performance were only applied May through October, the Dry Season. The LDOPA model demonstrated that at current SRWTP performance and at a discharge rate of 181 mgd, without any additional reduction in UOD load, dissolved oxygen concentrations in the Sacramento River downstream of the SRWTP discharge do not drop below the 7.0 mg/L Basin Plan objective during the Wet Season period extending from November 1 through April 30. (SRCSD 2010.) The LDOPA model did show that UOD reductions in SRWTP effluent are necessary during the Dry Season period of May 1 through October 31 in order for dissolved oxygen concentrations in the Sacramento River downstream of the SRWTP discharge to remain above the 7.0 mg/L Basin Plan objective. (LDOPA (2010).) Based on the findings in the LDOPA report, Dry and Wet period seasonal limitations on UOD load from the SRWTP is an appropriate method for controlling oxygen demanding substances in SRWTP effluent to ensure compliance with the Basin Plan objective for dissolved oxygen. The focus on UOD is consistent with the dissolved oxygen Basin Plan objective being protected, as it is the total oxygen demand in the SRWTP effluent that affects the downstream dissolved oxygen concentration.

Attachment K suggests that the historic dissolved data collected by the District is invalid because it shows an "upward bias in the data." (Tentative Permit at p. K-9.) However, Attachment K also admits that the data collected by the District was done under a rigorous quality assurance and quality control protocol. Conversely, the DWR dissolved oxygen data from Hood may be biased downward. To address the concerns with the consistency of dissolved oxygen data collected at various locations along the Sacramento River and by multiple agencies, the District

initiated a continuous dissolved oxygen monitoring program.[65] The new program utilizes modern optical dissolved oxygen probes and a two way calibration/validation procedure to ensure high quality data. In a preliminary review of the continuous dissolved oxygen data being collected by the District, the Hood dissolved oxygen data were found to be consistently low. In the review of the LDOPA model and the District's continuous dissolved oxygen monitoring, it was found that there are enough concerns with the Hood dissolved oxygen data to not use them for model calibration.[66].

In response to the District's request for use of seasonal UOD limits, Attachment K disregards the request by finding that since changes in treatment or source control will be necessary to reduce dry season ammonia, wet season ammonia should be reduced by the same amount. Attachment K also states that, "[t]he Discharger did not offer compelling arguments to not reducing wet season ammonia limits. Therefore, Discharger's request for seasonal UOD requirements is not included in the permit." (Tentative Permit at p. K-9.) However, Attachment K provides no evidence or explanation as to why reduction in wet season ammonia is necessary to ensure compliance with the dissolved oxygen Basin Plan objective. Further, Attachment K fails to provide any proper justification as to why UOD limits are not a proper method for controlling loading of oxygen demanding substances in the Sacramento River and the Delta. The District's proposal, however, would ensure compliance with the 7.0 mg/L dissolved oxygen Basin Plan objective throughout the year, and would trigger the need for the District to reduce oxygen demanding substances in SRWTP effluent accordingly. (LDOPA at pp. 21-23.)

As discussed further in section IV below, full nitrification and denitrification of SRWTP effluent is not consistent with the BPTC standard expressed in Resolution No. 68-16. In general, BPTC applies where there are high quality waters, and it incorporates an element of reasonableness for the requirement as compared to the environmental benefit to be gained. (See section IV, post.) Attachment K does not support that there will actually be an environmental benefit by requiring full nitrification and denitrification. Instead, it merely states that there is "conflicting data," and that the District's use of assimilative capacity provides no assimilative capacity for other dischargers. (Tentative Permit at p. K-9.) In contrast, requiring wet season reductions in UOD loads would result in dissolved oxygen concentrations in the Sacramento River downstream of the SRWTP discharge to continue to be above the 7.0 mg/L Basin Plan objective from November 1 through April 30. Wet season reduction in UOD loading would not bring dissolved oxygen concentrations in the Sacramento River downstream of the SRWTP discharge into compliance with the Basin Plan objective, it would simply assist in the attainment of a water quality standard that is already being met in the receiving water during this time period. Further,

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[65] Sacramento Regional County Sanitation District, "SRCSD DO Continuous Monitoring Preliminary Results", June 8, 2010, prepared by Larry Walker Associates.

[66] Memorandum, Sacramento Regional LDOPA, to Diana Messina, CVRWQCB, from Jonathan Butcher, Tetra Tech, June 29, 2010.

the Tentative Permit and Attachment K fail to provide necessary evidence to support why full nitrification is required during either season. As indicated, the District recognizes that oxygen demanding substances in the SRWTP effluent must be reduced in the dry season in order to ensure that dissolved oxygen objectives are obtained and maintained. (LDOPA at p. 20.) However, it is not necessary to build full nitrification facilities that meet ammonia limits of 1.8 mg/L-N and 2.2 mg/L-N, AMEL, and MDEL respectively, to ensure compliance with dissolved oxygen Basin Plan objectives. To this end, the cost of building full nitrification facilities is not commensurate with the environmental benefit to be gained, and is therefore an unreasonable requirement.[67]

Attachment K also attempts to find that the oxygen demanding substances in the SRWTP discharge ". . . results in no assimilative capacity for any other cities and communities to discharge oxygen demanding constituents which is needed for them to grow," and therefore full nitrification is appropriate. However, the argument here is misplaced for several reasons. Attachment A includes a list of 20 different POTWs that discharge to waterways in the greater Sacramento region and beyond. Attachment K states that these facilities either already implement or are in the process of implementing BPTC treatment processes (assuming that full nitrification and denitrification is BPTC), and that such facilities may be affected by the lack of assimilative capacity. (Tentative Permit at p. K-9.) Regardless of whether such facilities are building, or have already built treatment facilities that nitrify effluent, such a statement is irrelevant. Further, it is not true that the communities identified "would be affected by the lack of assimilative capacity for oxygen demanding substances" due to the oxygen demanding substances contained in SRWTP effluent. For example, with respect to ten of the entities listed (Roseville, Placerville, Yuba City, Live Oak, Colfax, Lincoln, Olivehurst/Marysville, Auburn, North Auburn, and Granite Bay), these facilities discharge treated effluent to receiving waters tributary to the Sacramento River upstream of the SRWTP discharge. Dissolved oxygen concentrations in the Sacramento River above the SRWTP discharge are of sufficient concentration to provide some level of assimilative capacity for oxygen demanding substances contributed by upstream dischargers and still remain above the 7.0 mg/L Basin Plan objective. The cities of Live Oak, Marysville, Yuba City, Colfax, Auburn, Roseville, Lincoln, and Placerville are all currently discharging treated effluent containing some level of oxygen demanding substances, and do not appear to be causing exceedances of dissolved oxygen concentrations in the Sacramento River below the Basin Plan objective. Further, many of these entities discharge to effluent dominated waterways that are miles from the Sacramento River.

[67] The Permitting Options document suggests, without discussion, that partial or seasonal nitrification may be impermissible under the "bypass rule." (Permitting Options, p. 7.) The bypass rule does not preclude sizing or operation of facilities as appropriate to meet WQBELs. In fact, the Regional Board has approved such an approach. (See, for example, Order R5-2008-0055 [seasonal filtration].)

When considering the wastewater treatment facilities that discharge effluent to receiving waters tributary to the Yolo Bypass or Cache Slough (i.e., Davis, Woodland, Vacaville), oxygen demanding substances in their effluents have completely exerted their effects on water column dissolved oxygen concentrations prior to their commingling with Sacramento River water upstream of the city of Rio Vista. Thus, treated effluents from the cities of Woodland, Davis, and Vacaville would be expected to have little if any impact on dissolved oxygen concentrations in the Sacramento River. Finally, with regard to those facilities that discharge their effluent to receiving waters either within or tributary to the Delta downstream of Rio Vista (i.e., Stockton, Galt, Tracy, Manteca, Lodi, El Dorado Hills, and Ironhouse), the District's far-field modeling has shown that SRWTP effluent comprises 0.82 - 3.53% (99.91 percentile at a discharge rate of 181 mgd) of any given volume of water at various locations in the Delta. It is inconceivable that a hypothetical 2% of SRWTP effluent in a volume of water at some location in the Delta would exert such a demand on dissolved oxygen that there would be no assimilative capacity in the receiving water for additional oxygen demanding substances contributed by another discharger. As noted, the District is committed to reducing the UOD load of its effluent to the degree necessary to avoid producing dissolved oxygen concentration excursions below the Basin Plan objective in the Sacramento River downstream of the SRWTP discharge. In this regard, the District's allowed effects on dissolved oxygen levels would be less than allowed under its current permit. However, full nitrification is not necessary, nor is it supportable based on the information.[68]

C. Ammonia Mixing Zones Described in Dilution Alternatives 2 and 3 Are Protective of Beneficial Uses, Meet All SIP and U.S. EPA NPDES Permitting Requirements, and Should Be Utilized in This Permit in the Derivation of Water Quality-Based Effluent Limitations for Ammonia

As described in greater detail in section V, post, the District has met all of the requirements in the SIP, U.S. EPA Technical Support Document (TSD), and the Basin Plan to gain acceptance of its mixing zone and associated dilution credits. The Tentative Permit directly states that the proposed chronic aquatic life mixing zone ". . . complies with the SIP . . ." and ". . . also complies with the Basin Plan, which requires that the mixing zone not adversely impact beneficial uses." (Tentative Permit at p. F-37.) Despite these findings, the proposed Tentative Permit does not grant mixing zones.

[68] It should be noted that the regionalization of sewer treatment that the District began in the 1970s was driven in part as a means to avoid multiple municipal discharges to the lower Sacramento River and the overlapping water quality impacts that could result from such a scenario. The Regional Board continues to encourage regionalization, and to that end, the District has regionalized three facilities in the last several years (West Sacramento, Courtland, and Walnut Grove).

Proposed denial of the ammonia mixing zones proposed by the District is linked to ten reasons cited in the Tentative Permit. (Tentative Permit at pp. F-54 - F-56.) The Fact Sheet language states that acute and chronic aquatic life dilution credits for ammonia have not been granted, for the following reasons:

1. Recent studies suggest that ammonia may be acutely toxic to native *Pseudodiaptomus forbesi*, a copepod.

2. The SRWTP is a major source of ammonia to the Delta.

3. Recent studies provide evidence that ammonia from the SRWTP is contributing to the inhibition of nitrogen uptake by diatoms in Suisun Bay.

4. Along with the invasive clam *Corbula* and high turbidity, ammonia is attributed to reducing diatom production and standing biomass in Suisun Bay.

5. Ammonia may be a cause of the shift of the aquatic community from diatoms to smaller phytoplankton species that are less desirable as food species.

6. Ammonia is shown to affect adult *Pseudodiaptomus forbesi* reproduction at concentrations greater than 0.79 mg/L and to affect juvenile and nauplii at concentrations greater than or equal to 0.36 mg/L. These concentrations are found downstream from the SRWTP discharge.

7. U.S. EPA expects to publish 2009 Ammonia criteria in early 2011, which include stringent criteria to protect freshwater mussels, which likely result below the SRWTP discharge.

8. SRWTP uses all of the assimilative capacity for oxygen demanding substances in the Sacramento-San Joaquin Delta.

9. The SRWTP effluent contains nitrosamines at levels that are greater than 100 times the primary Maximum Contaminant Level (MCL).

10. The SRWTP must fully comply with Resolution No. 68-16 that requires BPTC, which is nitrification and denitrification for the SRWTP.

None of the above ten reasons represent justification for the denial of chronic and acute mixing zones for ammonia for the SRWTP discharge. Significant information is provided in the District's comments and other information provided above and elsewhere, which addresses many of these reasons. That information, together with the rationale provided below, is pertinent to the fact that the ten reasons do not provide meaningful or sufficient justification for a decision not to grant dilution credits for ammonia.

Of the 10 reasons cited, only 3 (nos. 1, 6, and 7) potentially have anything to do with the acute or chronic toxicity of ammonia in the area of the proposed mixing zones. Each of those reasons deal with unadopted numeric concentrations that are not approved criteria for the protection of aquatic life. Two of the reasons (nos. 1 and 6) deal with the results from laboratory research regarding copepod toxicity, which has not been published or peer reviewed. (See also section II.A.6.) In the case of no. 7, U.S. EPA Region IX staff has told the Regional Board that it would be inappropriate to use the draft 2009 ammonia criteria as the basis for permit limits in the District's NPDES permit. (See section II.E., post.) Just as it is inappropriate to use draft U.S. EPA criteria, it is inappropriate to use the unpublished, un-peer reviewed laboratory research on the copepod, *P. forbesi*.

Regardless of the above, none of the 3 reasons (nos. 1, 6, and 7) would stand as a basis for not approving acute or chronic mixing zones for ammonia. In the normal course of NPDES permit procedures, and as specified under the SIP, if the numeric concentrations mentioned in the Tentative Permit were deemed to be acceptable for use as criteria, they would be used to establish WQBELs using the District's approved dynamic modeling tool and the proposed acute and chronic mixing zones, in a similar way that any other criteria would be used.

Reason 2, the relative magnitude of the SRWTP discharge as a source of ammonia in the Sacramento River, is, in and of itself, certainly no reason to deny approval of the proposed mixing zones.

Reasons 3, 4, and 5 are all far-field concerns that do not provide a reason for denial of the proposed mixing zone for ammonia.[69] Reasons 3 and 4 have not been quantified and do not represent settled scientific opinion. As described previously, there is clear documentation by numerous reputable researchers in the Delta that attributes major significance to the benthic grazing by the invasive clam *Corbula* to the significant drop in phytoplankton and diatom levels in Suisun Bay since 1987. Light limitation is also recognized as a significant factor limiting phytoplankton blooms in Suisun Bay. Hypothetical inhibition effects that continue to be asserted have not been accepted as a significant phytoplankton or food web effect at this time. Neither the independent CalFed research panel convened in 2009, the NAS panel convened in 2010, the Regional Board, the State Board, nor the DFG have endorsed this hypothetical effect as a major factor in the Delta food web. As correctly noted in the Tentative Permit Options, "the overall

[69] To the extent that any reasons do not relate to water quality in the mixing zone, they are not an appropriate basis for the specific proposed WQBELs. To the extent they relate to potential toxicity under the narrative toxicity objective, there has not been compliance with 40 C.F.R. section 122.44(d)(1)(i). In fact, reliance on reasons 1, 6 and 7 is inconsistent with this provision as well, as they are necessarily based on the narrative toxicity objective and there are no findings consistent with the requirements of the regulation. In other words, there is no logic as to why any of the ten reasons lead to requiring effluent ammonia quality as specified in the proposed effluent limitations.

impact of the nitrogen uptake inhibition, particularly on Delta smelt food, is not understood." (Tentative Permit Options at p. 4.)

Similar statements are true for reason 5, which exists a hypothesis that has not been corroborated by scientific studies. In fact, the Tentative Permit acknowledges that such studies are ongoing, that the permit may need to be reopened to address the results that may arise from those studies, and the Tentative Permit would require the District to help fund such studies. Two aspects of reason 5 are in question: (a) whether ammonia is responsible for a shift from diatoms to other plankton species and (b) whether the smaller plankton species are actually less desirable as food species. However, there are significant concerns with these hypotheses, as described herein.

Reason 8 (effect of the SRWTP discharge on dissolved oxygen levels in the far-field waters of the Sacramento River) provides no reason for denial of proposed mixing zones for ammonia. If the Regional Board is concerned about creating additional assimilative capacity in the river by restricting ammonia and BOD discharges from the SRWTP, it can accomplish that by restricting mass loadings of those constituents. The LDOPA report prepared and submitted to the Regional Board by the District provides the framework for such decisions. Further, it should be noted that the statement regarding the effect of the SRWTP on the assimilative capacity in the Sacramento-San Joaquin Delta is grossly inaccurate. The effects of the SRWTP discharge occur in the Lower Sacramento River between Freeport and Rio Vista and do not extend to other areas on the Delta. Also, few, if any, of the POTWs listed in the Tentative Permit discharge to the Lower Sacramento River or its tributaries and are sufficiently distant from this reach of the Sacramento River to be unimpacted by the allocation of dissolved oxygen assimilative capacity to the SRWTP.

Reason 9, with respect to the levels of nitrosamines in the SRWTP discharge, is not an appropriate reason for denying ammonia mixing zones. The proper way to evaluate this issue is to examine the ambient concentration of N-nitrosodimethylamine (NDMA) (the one nitrosamine that is identified in the California Toxics Rule (CTR)) at the edge of the Harmonic Mean Mixing Zone, three miles below the SRWTP discharge.[70] (See 40 C.F.R. § 131.38.) Due to limitations in analytical capabilities to allow detection levels below the CTR criterion for NDMA (0.00069 µg/l), explicit data to describe this ambient condition is not available. Further, the District has provided information to support a finding that ambient NDMA levels at the edge of the Harmonic Mean Mixing Zone likely comply with the CTR criteria. (See section II.D, post.)

Reason 10, the imposition of nitrification and denitrification as BPTC, is an independent analysis that has no direct bearing on the mixing zone determination for ammonia. For the reasons described in section IV, post, the District disagrees that Resolution No. 68-16 requires

[70] It should be noted that the Tentative Permit, in numerous places, erroneously refers to the primary MCL for nitrosamines or NDMA. In fact, there is no federal of state MCL for either nitrosamines or NDMA. The proper citation is to the CTR criterion for NDMA.

implementation of these advanced treatment requirements. Regardless, this would be a stand alone determination that should not be considered in the decision to approve or deny mixing zones for ammonia.

In summary, as described above and detailed elsewhere in these comments, none of the ten reasons given in the Tentative Permit for denial of the proposed acute and chronic mixing zones for ammonia are reasonable or appropriate. The District has provided substantial information in the record to fulfill the requirements of the SIP, U.S. EPA TSD, and Basin Plan to gain approval of mixing zones and dilution credits for ammonia. As such, the proposed acute and chronic mixing zones for ammonia described in Dilution Alternative 3 should be approved as an element of the NPDES permit for the SRWTP discharge.

D. NDMA Arguments Are Not Substantial and Should Not Affect the Decision to Approve the Proposed Acute and Chronic Mixing Zones for Ammonia

The Tentative Permit and Attachment K collectively reference the levels of nitrosamines in the SRWTP effluent as the basis for denying dilution credits and mixing zones for ammonia. The statements and inferences made in the Tentative Permit regarding nitrosamines are not substantial and should not affect the decision to approve the proposed acute and chronic mixing zones for ammonia.

NDMA is a nitrosamine and is a chlorine disinfection by-product. A MCL has not been established and there is no MCL for NDMA in Title 22 of the California Code of Regulations, or in federal law or regulations. The CTR contains a very stringent human health criterion for NDMA based on a carcinogenicity risk level of 10^{-6} (CTR) and an assumption of long-term consumption. The CTR criterion (0.00069 µg/l) is much lower than the levels (0.003 to 0.010 µg/l) that have been considered for the regulation of NDMA in tap water under the Safe Drinking Water Act.

Because NDMA is considered to be a human health criterion, NDMA effluent limits are appropriately established based on concentrations occurring at the edge of the harmonic mean mixing zone.

Although NDMA has not been detected in the receiving water upstream from the SRWTP discharge, no assimilative capacity for NDMA is acknowledged in the Tentative Permit due to the fact that the analytical detection limits are above the CTR criterion. The analytical limitations that prevent determination of the actual ambient level of NDMA in the Sacramento River at Freeport are indirectly used to penalize the District in the consideration of the effects of NDMA on beneficial uses.

Sources of NDMA to surface waters can include release of chlorinated effluent from wastewater treatment plants (Mitch & Sedlak (2002)).[71] As municipal wastewater discharges are the only known source of NDMA to the Sacramento River, the concentration of NDMA upstream of SRWTP discharge would be dependent on NDMA from upstream chlorinated wastewater discharges. Since regionalization of wastewater treatment facilities in the Sacramento region in 1983, all Sacramento County wastewater discharges to the American and Sacramento Rivers were eliminated. The closest major wastewater discharges upstream from Freeport exceeding 5 mgd, which discharge to tributaries of the Sacramento River, are the City of Roseville (Dry Creek and Pleasant Grove plants) and the City of Yuba City. The City of Roseville employs ultraviolet disinfection at its facilities and therefore is not a source of NDMA. The City of Yuba City discharges chlorinated effluent to the Feather River approximately 50 miles upstream from Freeport and realizes significant initial and far-field dilution of its effluent.

A reasonable assessment of the fate of NDMA in natural waters indicates that any upstream contribution of NDMA would be essentially removed by degradation processes. A series of studies sponsored by the WateReuse Foundation found that NDMA removal from groundwater occurs primarily through volatilization and biodegradation (WateReuse Foundation (2006).)[72] Volatilization is a process that occurs in both groundwater and surface water. Further, NDMA is a semivolatile compound with a low boiling point (152 ˚C) and relatively high vapor pressure (2.67 mm Hg at 25 ˚C), suggesting a tendency towards volatilization and gas phase transport.

Other studies have shown that photolysis due to exposure to sunlight is another very important factor in reducing NDMA concentrations in surface waters. The half-life of NDMA in surface water exposed to sunlight is approximately 3-24 hours (Kennedy/Jenks/Todd (2008).)[73] This is important in considering the degradation of NDMA that occurs during the travel time of treated effluent from upstream wastewater discharges. For instance, for Yuba City, the travel time to Freeport during critical low flow periods exceeds 3 days, which is adequate time for elimination of NDMA from the river.

Due to NDMA tendencies toward volatilization and photolysis, it is likely that the ambient concentration upstream of SRWTP discharge is zero. With an upstream ambient concentration of NDMA of zero, the blend of SRWTP effluent with Sacramento River water at the edge of its harmonic mean mixing zone would meet CTR criteria, as demonstrated by simple considerations of average effluent NDMA (0.014 µg/l) for the period 2006 to 2010, and the harmonic mean dilution (56:1) that exists in the Sacramento River below Freeport. Based on these values, the calculated ambient NDMA concentration at the edge of the Harmonic Mean Mixing Zone would

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[71] Mitch, W.A., Sedlak, D.L. *Factors controlling nitrosamine formation during wastewater chlorination*, Water Science and Technology, Vol. 2, No. 3, pp. 191-198 (2002).

[72] WateReuse Foundation, Investigation of N-itrosodimethyline (NDMA) Fate and Transport (2006).

[73] Kennedy/Jenks/Todd, Final Project Report, Montebello Forebay Attenuation and Dilution Studies (March 2008).

be 0.00025 µg/l, which is less than the most restrictive CTR criterion (0.00069 µg/l), indicating that NDMA is not likely a significant water quality or human health issue in the Sacramento River below the SRWTP discharge.

E. Draft U.S. EPA 2009 Ammonia Criteria Are Not Appropriate for Use in the Development of Effluent Limits in This Permit

The Tentative Permit and Attachment K collectively reference the *Draft 2009 Update Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater* (Draft Ammonia Criteria) as one reason for denying dilution credits and requiring full nitrification. Any reliance on the Draft Ammonia Criteria is misplaced because it is a draft and not available for use in a regulatory setting. In an email exchange between Regional Board staff and U.S. EPA staff that is part of the permit record, U.S. EPA indicated that the Draft Ammonia Criteria would not be published until 2011. Further, U.S. EPA cautioned that the Draft Ammonia Criteria must be published by U.S. EPA and adopted by the states into their water quality standards ". . . before the value is adopted, legally binding and useful in permits." (Email Exchange Between Kathleen Cole Harder, Regional Board, and Lisa Foersom Huff, U.S. EPA (Aug. 2, 2010).)

Even if the Draft Ammonia Criteria were applicable, it does not provide a sufficient reason to deny a dilution credit to discharges from the SRWTP. (See section V, post.) The Regional Board approved the District's model and mixing zones for chronic criteria. (Letter to SRCSD, see section V, post; Tentative Permit at p. F-35.) The Draft Ammonia Criteria is a chronic criterion. (Tentative Permit at p. K-3.) Further, in a year-long nutrient study conducted by the Regional Board, "[a]mbient concentrations never exceeded the criteria." (Tentative Permit at p. K-3.) Thus, assimilative capacity for ammonia is available even if the more stringent Draft Ammonia Criteria is inappropriately used.

The District notes and agrees with the statements in the Tentative Permit that it is appropriate to use U.S. EPA's 1999 Update of Ambient Water Quality Criteria for Ammonia (1999 Ammonia Criteria) to interpret the narrative toxicity objective. As indicated in Attachment K, "when the approved mixing zones are considered, [the SRWTP's discharge] is in compliance with current USEPA acute and chronic ammonia criteria." (Tentative Permit at p. 1.) Conversely, it is inappropriate to use the Draft Ammonia Criteria as a basis for denying dilution credits or mixing zones for ammonia because it is not approved by U.S. EPA.

Further, it is important to properly characterize the Draft Ammonia Criteria and their relevance for evaluating impacts on POD species. Specifically, the Draft Ammonia Criteria are more stringent than the adopted 1999 Ammonia Criteria due to the consideration of ammonia toxicity to sensitive freshwater mussels. In fact, the Draft Ammonia Criteria are proposed to be bifurcated into separate categories, depending on the presence or absence of sensitive freshwater mussels species in a water body. The "without mussels present" criteria, which are driven by the protection of sensitive fish species, are no more stringent than the 1999 Ammonia Criteria, which are currently driven by the protection of sensitive fish species such as rainbow trout and

salmonids. In other words, with respect to the protection of Delta POD fish species, there is little difference between the 1999 Ammonia Criteria and the Draft Ammonia Criteria. Therefore, evaluations of ammonia toxicity to Delta fish using the 1999 Ammonia Criteria will continue to provide meaningful and pertinent conclusions going forward, regardless of the status of the finalization and adoption of the Draft Ammonia Criteria.

F. No Substantial Evidence Exists That Would Support That Additive or Synergistic Effects Occur at Relevant Ambient Concentrations Downstream from the SRWTP Discharge

Attachment K states that recent toxicity studies by Teh and Werner indicate that there are additional toxicants present in the SRWTP effluent that are resulting in chronic toxicity to aquatic species. It is alleged that constituents in SRWTP effluent are exerting a combined toxic effect on test organisms that is not observed when exposing the organisms to individual constituents. However, the studies referenced in Attachment K are not sufficient to support a theory that effluent from the SRWTP has additive and synergistic toxicity. The environmental relevance of exposure concentrations must be considered in the examination of evidence for synergistic effects.

Teh's 2008 study reported high toxicity to *E. affinis* in water collected from the Sacramento River at Hood eight miles downstream from the SRWTP discharge. However, the cause of toxicity was not confirmed in this study and statistical correlations with ammonia and toxicity were weak. The results from this 2008 study do not in any defensible way indicate or demonstrate that the SRWTP effluent caused the observed toxicity or contributed to additive or synergistic effects. Additional toxicity testing with copepods in 2009-2010 indicated that low conductivity was a major factor in determining survival of the test organisms (Werner et al. 2010). Considering the lack of statistical correlation and the demonstrated impacts to copepods caused by low conductivity, Teh's 2008[74] study results do not support the premise for which is it used in Attachment K. (See written testimony/comments of Cameron A. Irvine at p. 17.)

Similarly, the study by Werner referenced in Attachment K does not demonstrate the premise that the SRWTP effluent contributes to additive or synergistic toxicity in the Sacramento River. The Werner study reported possible synergistic or additive toxicity with ammonia and effluent based on tests with whole effluent or high percentages of effluent. However, possible effluent effects could only be found if concentrations of ammonia or effluent exceeded those that are actually present in the Sacramento River below the SRWTP discharge. It is not defensible to conclude from the work of Werner et al. (2009) that synergistic effects may be occurring after effluent enters the Sacramento River. The concentrations of SRWTP effluent (as percentages of

[74] Teh, S., et al. Toxic effects of surface water in the upper San Francisco Estuary on *Eurytemora affinis*. Final Report. (2008)

total flow in the river) that produced effects in these particular tests are well out of the range produced by the SRWTP discharge. The 7-day effects thresholds in Werner et al. (2009) for 47-day old delta smelt, expressed as percent effluent, were as follows: LC50 (25.7%), LC10 (10.6%), NOEC (9%).

In contrast, the percentages of effluent that occur in the Sacramento River below the SRWTP discharge are typically less than 3% the vast majority of the time[75] and never exceed 7%. In other words, ambient percentages of effluent in the Sacramento River just below the discharge are well below the no effects and all other thresholds for "percent effluent" obtained in Werner's effluent dosing experiments.

Repeat testing in 2010 on 4 other test periods did not show any toxicity to delta smelt ranging up to 28% effluent. Considering the additional information, Dr. Werner's studies fail to support the hypothesis that SRWTP effluent produces additive or synergistic toxicity.

G. Full Nitrification Is Not Justified Via Resolution No. 68-16

For the reasons described in section IV, post, the District disagrees that Resolution No. 68-16 requires implementation of these advanced treatment requirements. As discussed further below, Resolution No. 68-16 is designed to protect high-quality waters. However, it is not a zero-degradation policy. It generally requires that when permitting degradation, the Regional Board is required to ensure that additional degradation occurs pursuant to limits that require BPTC and that the additional degradation is to the maximum benefit to the people of the state. The determination of BPTC takes into consideration a number of factors including the consideration of alternatives. In this case, the Tentative Permit fails to consider alternatives with respect to partial nitrification as being BPTC. As discussed in section II.B.2, ante, partial nitrification would ensure protection of beneficial uses, which is the primary goal of Resolution No. 68-16.

III. REQUIREMENT FOR DENITRIFICATION

The Tentative Permit proposes to require full "denitrification." The estimated cost of full denitrification is $780 million. The evidence does not support the requirement. Further, there is no basis to conclude that "full denitrification" would result in compliance with the effluent limitation that is proposed.

[75] Based on 7-day running averages for Sacramento River flow between 1998-2009, the 99.5th percentile percent effluent is 2.8%. (See M. Mysliwiec, Larry Walker Associates, unpublished data.)

A. Scientific Evidence Has Not Been Presented in the Tentative Permit to Justify the Proposed Denitrification Requirements on the Basis of Protecting Aquatic Life Uses in the Delta

The "RPA Results" section of the Tentative Permit (p. F-71) refers to the Primary MCL for nitrate and concludes that reasonable potential exists to cause or contribute to exceedance in the future. However, the "WQBELs" section does not discuss a WQBEL based on the adopted water quality standard. Accordingly, no properly-derived WQBEL is being proposed.

No information has been presented or referenced regarding the positive or negative impact of reducing nitrate in a nitrified SRWTP effluent. The stated rationale for reducing nitrate from SRWTP is to keep the nitrogen to phosphorus (N:P) ratio from changing. (Tentative Permit at p. F-71 [*"There are theories that changing the ratio of nitrogen to phosphorus can change the ecology of a waterbody, so removal of nitrogen from the effluent would keep the nitrogen to phosphorus ratio from changing."*].)

In fact, the converse is true. Denitrification of SRWTP effluent would reduce existing N:P ratios in the Sacramento River and Suisun Bay, with unknown consequences. Deviations in atomic TN:TP ratios in water samples from the classic "Redfield Ratio" of 16 (named for the oceanographer who determined in 1934 that the mean atomic N:P ratio of marine phytoplankton is 16 when neither nutrient limits growth) are often used as a rough indicator of relative N- or P-limitation of phytoplankton growth. Modern surveys indicate that TN:TP <18-22 may indicate N limitation in freshwater and ocean settings, but phosphorus limitation is generally not expected unless TN:TP ratios exceed 50 (Guilford & Hecky (2000))[76]. Boynton et al. (2008)[77] show that TN:TP ratios for 34 coastal, estuarine, and lagoon ecosystems trend somewhat above 16. Monthly samples for 3 IEP Suisun Bay monitoring stations for 2002-2007 provides a mean atomic TN:TP ratio of about 17 (16.7; Engle *unpublished* data[78]). This ratio is very close to the classic "Redfield Ratio." Lower ratios would be considered by some investigators as potential indicators of relative nitrogen deficiency in the water column. There are some indications that nutrient limitation shifts between P limitation and N limitation between spring and summer in temperate estuaries (Conley 2000)[79]. Regardless, the relationships between cellular indicators of nitrogen or phosphorus deficiency, inorganic nutrient concentrations, phytoplankton taxonomy and stoichiometry, and TN:TP ratios have not been studied in the SFE.

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[76] Guildford, S. J. and R. E. Hecky. 2000. Total nitrogen, total phosphorus, and nutrient limitation in lakes and oceans: Is there a common relationship? Limnology and Oceanography 45:1213-1223.

[77] Boynton, W.R., J.D. Hagy, J.C. Cornwell, W.M. Kemp, S.M. Greene, M.S. Owens, J.E. Baker, and R.K. Larsen. 2008. Nutrient budgets and management actions in the Patuxent River Estuary, Maryland. Estuaries and Coasts. DOI 10.1007/s12237-008-9052-9.

[78] A print-out of the data used for this calculation is provided in the District permit response package.

[79] Conley, D.J. (2000) Biogeochemical nutrient cycles and nutrient management strategies. Hydrobiologia 410:87-96.

At this time, assertions that current N:P ratios in the SFE have driven observed changes in phytoplankton composition are pure speculation. The Tentative Permit implies that Parker et al. (2010) and Glibert (2010) provide some kind of meaningful evidence that would support the hypothesis that current ammonia:nitrate or N:P ratios in the SFE provide a competitive disadvantage to diatoms and a competitive advantage to blue-green algae and flagellates. (Tentative Permit at p. K-6.) However, neither citation refers to direct evidence that nutrient ratios explain changes in phytoplankton composition in the SFE. Setting aside the fact that Glibert's statistical approach was invalid (Engle & Suverkropp (2010)), Glibert omitted correlation analyses between nutrient *ratios* (TN:TP, NO_3:NH_4, or DIN:DIP) and phytoplankton indices (chlorophyll-a or individual taxonomic groups) from her research article. In fact, Glibert's transformed data for NO_3:NH_4 were not compared to *any* of the biological data (phytoplankton, copepods, clams, or fish) in her article. They were only compared to trends in Delta outflow. *As a consequence, the publication did not even make the case (even accepting its flawed statistical approach) that nutrient ratios and phytoplankton composition are statistically related to each other*. In addition, the Glibert article reviews no direct experimental evidence from the SFE or other systems that supports her conclusions regarding nutrient ratios and estuarine phytoplankton composition. The Tentative Permit includes an incomplete footnoted citation for Parker et al. (2010) that refers to an abstract for an oral talk given by A. Parker on Sept. 28, 2010, at the recent Bay-Delta Science Conference (K. Harder, CVRWQCB, pers. comm.). (Tentative Permit at p. K-6.) However, neither the abstract for the talk nor the oral presentation at the conference provided any information regarding relative growth rates of different phytoplankton taxa presented with different nutrient ratios. In fact, only bulk parameters which apply to the aggregate phytoplankton community (e.g., chlorophyll-a) were described in this presentation. These citations notwithstanding, the Tentative Permit admits to the lack of information for the SFE on this topic. (See Tentative Permit at pp. K-6 - K-7 ["*Dr. Peggy Lehman and T. Brown have documented that the algal community in the Delta has changed from a diatom to a flagellate/blue-green algal dominated community consistent with the predictions of Dugdale et al. and Glibert. Whether this is the result of changes in nutrient concentrations and/or ratio is not known.*"]; see also Tentative Permit Options at p. 7 ["*adverse impacts from changed nitrogen:phosphorus ratios in the Delta have not been demonstrated. The overall impact of . . . nitrogen on the Delta is not understood*."].) Finally, as discussed in section II.A.4-5, the Tentative Permit does not acknowledge other physical and biological factors which can shift phytoplankton composition in estuaries, nor does it provide evidence that the shift in phytoplankton composition is harming populations of copepods that are prey for POD fishes, or that it has any other significant trophic effects.

Potential negative ramifications of lower N:P ratios, or removing nitrate from a nitrified effluent, do not appear to have been considered in development of the Tentative Permit. For example, the competitive advantage of nuisance species of N-fixing cyanobacteria (e.g., *Aphanizomenon* and

Anabaena) can increase in estuaries when N:P ratios are reduced if seed populations are present (Piehler et al. (2002))[80]; both taxa are present in the upper SFE[81]. A stated concern in the Tentative Permit regarding ammonia levels in SRWTP effluent is that it inhibits uptake of nitrate by phytoplankton in Suisun Bay, resulting in possible unquantified effects on diatom blooms, and (highly speculative) effects at higher trophic levels. Significant concern exists regarding the low productivity of the Delta (Baxter et al. (2007))[82], and currently only a small fraction of in-Delta freshwater phytoplankton production escapes loss processes such as burial, in-Delta grazing, and direct export in water diversions, and is transported into the brackish Delta (confluence zone and Suisun Bay) where the early life stages of POD fishes rear (Jassby et al. (2002))[83]. Because there is evidence from Parker et al. (2010) that Sacramento River phytoplankton are nitrogen-limited upstream from the SRWTP (see section II.A.4), it is reasonable to question whether primary productivity in the Sacramento River would increase following implementation of a full nitrification-denitrification requirement.

Given (1) the absence of direct evidence in the Tentative Permit that lowering N:P ratios would provide any benefits to the food web, (2) the lack of consideration of possible negative impacts of lowering N:P ratios, (3) the currently low subsidy of phytoplankton biomass provided to the brackish Delta from the freshwater Delta, (4) the possibility that a nitrified discharge would alleviate observed N-limitation for Sacramento River phytoplankton entering the freshwater Delta, and (5) that a tacit goal of the Tentative Permit is to increase access of diatoms to nitrate downstream from the SRWTP, the requirement for denitrification seems somewhat contradictory and has not been justified by ecosystem-related arguments in the Tentative Permit.

B. No Adopted Water Quality Objectives or Criteria Exist to Address the Ecosystem Concern Raised in the Tentative Permit

There currently exist no adopted water quality objectives, or water quality criteria for nitrate in the Delta that are established to protect aquatic life. At most, the Regional Board could rely on the narrative objectives in the Basin Plan to argue that it is appropriate to reduce nitrate concentrations to protect aquatic life uses. However, when interpreting narrative objectives,

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[80] Piehler, M. F., J. Dyble, P.H. Moisander, J. L. Pinckney, and H. W. Paerl. 2002. Effects of modified nutrient concentrations and ratios of the structure and function of the native phytoplankton community in the Neuse River Estuary, North Carolina, USA. Aquatic Ecology 36:371-385.

[81] Species belonging to the genera *Anabaena* an *Aphanizomenon* are on the list of species from IEP phytoplankton monitoring data in the upper SFE.

[82] Baxter, R., R. Breuer, L. Brown, M. Chotkowski, F. Feyrer, M. Gingras, B. Herbold, A. Müller-Solger, M. Nobriga, T. Sommer, and K. Souza. 2008. Pelagic organism decline progress report: 2007 Synthesis of results. Interagency Ecological Program for the San Francisco Estuary.

[83] Jassby, A.D., Cloern, J.E., Cole, B.E. (2002) Annual primary production: patterns and mechanisms of change in a nutrient-rich tidal estuary. Limnol Oceanogr 47:698-712.

federal regulations require that effluent limits be established using one or more of the three options specified. (40 C.F.R. § 122.44(d)(1)(vi).) The options include using a calculated numeric water quality criterion, using U.S. EPA's water quality criteria published under section 304(a) of the Clean Water Act (CWA), or establishing effluent limits based on an indicator parameter. (*Ibid*.) Here, the Tentative Permit provides no information or evidence to suggest that any of the 3 options specified in federal regulations have been employed, nor is there any available scientific or technical information anywhere to support the use of 0.26 mg/L as an appropriate criterion for the protection of aquatic life at any location. In the absence of being able to identify or support appropriate numeric criteria to interpret the narrative water quality objective, the Regional Board is precluded from adopting a final WQBEL for the protection of aquatic life.

C. Denitrification Is Not Needed to Protect the MUN Use Based on the Information Provided in the Tentative Permit and Fact Sheet

To protect public health, DPH has adopted a Primary MCL for nitrate of 10 mg-N/L. If most of the ammonia in the current SRWTP effluent is converted to nitrate, the resultant undiluted effluent will contain nitrate concentrations which exceed the Primary MCL. However, as stated in the Tentative Permit Options, "[t]here is sufficient dilution available in the Sacramento River that the river after mixing [with a nitrified effluent] will not exceed the nitrate drinking water standard." (Tentative Permit Options at p. 7.) The Tentative Permit also states that there are no known drinking water intakes within the immediate vicinity of the discharge. The closest downstream drinking water diversion is the Barker Slough Pumping Plant, 40 miles distant which diverts water from Barker Slough into the North Bay Aqueduct. (Tentative Permit at p. 39.) The North Bay Aqueduct then supplies water to remote drinking water intakes. Modeling completed by the District indicates that the Sacramento River, and therefore the SRWTP discharge, has little influence on the quality of water in Barker Slough. The Tentative Permit properly notes that the effluent will be sufficiently diluted at downstream drinking water diversion points to meet the nitrate MCL. (Tentative Permit Options at p. 8.)

The District concurs with the Tentative Permit, as summarized above, which indicates that denitrification of SRWTP effluent is not needed to protect the drinking water uses of the Lower Sacramento River and Delta.

D. The Proposed Effluent Limit for Nitrate Is Not Attainable with Denitrification Facilities

The Tentative Permit proposes a final effluent limit for nitrate as an AMEL of 0.26 mg/L. (Tentative Permit at p. 13.) The Tentative Permit claims that the removal of nitrate and nitrite is technologically feasible. To that end, the Tentative Permit proposes a final effluent limit based on information contained in a memorandum submitted by the District to the Regional Board. (See *Analysis of Costs and Benefits of Advanced Treatment Alternatives for the Sacramento Regional Wastewater Treatment Plant* (May 2010) (Cost/Benefit Analysis).) Even if

denitrification were called for, the use of the 0.26 mg/L value for nitrate as an effluent limit representing the ability of denitrification facilities is inappropriate.

1. Proposed Effluent Limit Is Inappropriately Based

The effluent concentrations estimated in the Cost/Benefit Analysis were part of a technical memorandum prepared by Carollo Engineers, which compared relative pollutant reductions that might be achieved for a wide range of pollutants among five different alternative advanced treatment trains. (Technical Memorandum-Advanced Treatment Alternatives for the Sacramento Regional Wastewater Treatment Plant (March 2009) (Carollo (2009).) In that memorandum, the estimated effluent concentrations were based on a simple averaging period of recorded SRWTP effluent values, and were planning level estimates (i.e., June 2005-July 2008). (Carollo (2009), at p. 4.) It was never expected nor intended that such values would be used to set effluent limits. (See Project Memorandum from Steve McDonald, Carollo Engineers (Sept. 2010), Comments on the Nitrate and Ammonia Effluent Limit in the SRWTP Tentative Order (Project Memo Sept. 2010); see also Written Testimony and Comments of Stephen McDonald.) Further, Carollo specifically stated that in order to determine actual technical feasibility of various treatment trains, pilot scale studies are essential because the technical memorandum did not consider influent and effluent variability. (Project Memo Sept. 2010, at pp. 2-3.) Carollo also explained that the approach used in the technical memorandum was one that was suitable only for planning-level analyses, and did not include any consideration as to what could reasonably be achieved using different averaging periods. (*Id*. at p. 4.) Considering the qualifications and caveats provided in the Carollo 2009 memorandum, it is wholly inappropriate for the Tentative Permit to rely on this value for permitting purposes.

2. Proposed Effluent Limit for Nitrate Is Not Achievable Through Available Denitrification Treatment Processes

In addition to the explanatory information provided by Carollo Engineers, other wastewater design experts find that the proposed nitrate AMEL limit of 0.26 mg/L is unachievable. Specifically, Dr. Denny S. Parker, NAE, P.E., states that he can identify "no plant in the United States (US) that meets the criterion of 0.26 mg/L nitrate-N on a monthly average basis." Dr. Parker's expert testimony is based on extensive research over three years as the co-principal investigator for a research study sponsored by the Water Environment Research Foundation (WERF), and Water Environment Foundation (WEF). The purpose of the study is to identify the best performing nutrient removal plants across North America and to survey as many as was practical. In separate material being submitted by the District, Dr. Parker describes the investigations major findings: (1) statistical variability is characteristic of all exemplary plants; and, (2) local conditions impact performance achieved on average and in terms of statistical variability. With respect to statistical variability, Dr. Parker further states that concern here is specifically characteristic of advanced treatment processes that are targeted at very low concentrations, and not for secondary treatment processes. Based on Dr. Parker's investigation,

only a single plant subject to the WER/WERF survey could meet the 0.26 mg/L nitrate value as a 36-month average. No plant was identified that could meet the value as a monthly effluent limit.

E. The Argument for the Need for Denitrification to Satisfy State Board Resolution No. 68-16 Is Wholly Inadequate

For the reasons described in section IV, post, the District disagrees that Resolution No. 68-16 requires implementation of these advanced treatment requirements.

No evidence has been provided that nitrate would cause pollution or nuisance and/or that denitrification would provide maximum benefit to the people of the state. The later assertion requires a balancing of costs and benefits. The record clearly shows that the Regional Board does not know whether a benefit would occur. The record also shows that denitrification would be extremely costly. Therefore, there is no showing of need for denitrification as BPTC.

F. Nitrate Permitting Options

For the reasons stated above, the District generally supports the "Nitrate Removal Alternative 1," with the qualification that, if a WQBEL is required based on the MCL, any effluent limitations include dilution credit.

IV. ANTIDEGRADATION

Proposing an unprecedented policy approach to the renewal of a permit for a municipal discharger, the Tentative Permit finds that it is appropriate to conduct a new "antidegradation"[84] analysis, in section IV.D.4 of the Fact Sheet. The new antidegradation analysis is improper for several reasons. The Tentative Permit fails to provide any basis in law or guidance for making this determination. In fact, State Board orders and State Board guidance interpreting and implementing Resolution No. 68-16 and application of the federal antidegradation policy (40 C.F.R. § 131.12) all indicate otherwise. In addition, even if such an analysis were applicable, the Tentative Permit's "antidegradation" analysis is superficial, inconsistent with applicable law and policy, and based on erroneous, argumentative assertions.

[84] The Regional Board and others frequently refer to Resolution No. 68-16 as the State's "Antidegradation" Policy. However, as the State Board indicated in Order No. 86-8, it declined to term Resolution No. 68-16 as the "Nondegradation Policy" as the term "nondegradation" does not appear in the policy's title. Like the term nondegradation, the term "antidegradation" does not appear in the title of Resolution No. 68-16.

A. Renewal of NPDES Permit Not an Action Subject to State's "Statement of Policy With Respect to Maintaining High-Quality Waters in California" (Resolution No. 68-16) or the Federal Antidegradation Policy

Since adoption of Resolution No. 68-16 in 1968, the State Board has issued orders that explain that application of the policy is triggered when the regional or state board action will reduce existing high quality water. (*In the Matter of Petitions of the County of Santa Clara, et al.*, Order No. WQ 86-8 ["this statement [i.e., Resolution No. 68-16] sets forth the circumstances under which *change* to existing high quality water will be allowed."] at p. 28, emphasis added; *In the Matter of the Petition of Rimmon C. Fay*, Order No. WQ 86-17 ["Before approving any reduction in water quality, or any activity that would result in a reduction in water quality, the Regional Board must first determine that the change in water quality would not be in violation of State Board Resolution No. 68-16 or the federal antidegradation policy."] at p. 17; *In the Matter of Petitions for Reconsideration of Water Quality Certification for the Re-operation of Pyramid Dam*, Order WQ 2009-0007 ["the federal antidegradation policy and State Water Board Resolution 68-16 apply to reductions in water quality. [Citation omitted.] This includes consideration of changes that have already occurred, if they occurred after the state and federal policies took effect, *but have not been reviewed for consistency with those policies*." (Emphasis added)] at p. 12.) Further, State Board guidance provides that the policy does not require "antidegradation" analysis when existing water quality will not be reduced by the proposed action. (Antidegradation Policy Implementation for NPDES Permitting, Administrative Procedures Update 90-004 (APU 90-004) at p. 2.) Existing water quality includes water quality already permitted or authorized, even if the permitted degradation has yet to occur. (APU 90-004, at p. 4.)

With respect to the federal antidegradation policy, U.S. EPA Region 9 guidance states, "[t]he first step in any antidegradation analysis is to determine whether or not the proposed action will lower water quality . . . . If the action will not lower water quality, no further analysis is needed and EPA considers 40 CFR 131.12 to be satisfied." (Guidance on Implementing the Antidegradation Provisions of 40 C.F.R. § 131.12 (June 3, 1987) at p. 4.) State guidance issued relative to application of the federal antidegradation policy in California confirmed this approach and stated as follows: "The three-part test set forth in the federal antidegradation policy is triggered by reduction in surface water quality. The first-step in analyzing the requirements of the federal antidegradation policy as applied to a particular activity is to determine if the activity will lower surface water quality; only if there is a reduction in water quality must the three-part test be applied to determine if the activity may be permitted." (Memorandum to Regional Board Executive Officers from William R. Attwater, Chief Counsel, Federal Antidegradation Policy (Oct. 7, 1987) (Attwater Memo re: Federal Antidegradation Policy) at p. 3.)

In this case, the Tentative Permit correctly acknowledges that antidegradation analyses were completed prior to the granting of the 181 mgd discharge capacity. (Tentative Permit at p. F-90.) The Tentative Permit also admits that it would not allow for an increase in flow or mass for any constituent of concern, except cyanide. (*Ibid*.) With respect to cyanide, the District performed

and submitted a dynamic model, which represents a more accurate picture of mixing zone concentration and therefore supports adoption of a less stringent permit limit. (*Id.* at p. F-89.) In other words, compliance with the policies was previously considered, and the permit does not allow for a reduction in water quality. Thus, application of the state and federal antidegradation policies has not been triggered.

The Tentative Permit asserts that a new analysis should be conducted because conditions in the Delta have changed.[85] The policy and associated guidance do not require a new analysis based on subjective evaluation of whether a "change" has occurred since the time a discharge was originally authorized. Moreover, it is not the Regional Board's practice to subject existing permitted discharges to complete antidegradation analysis. For example, a recently adopted permit for the City of Rio Vista, which also authorizes discharges to the Sacramento River within the Delta, finds that because the Order did not allow for an increase in flow or mass of pollutants, a complete antidegradation analysis was not necessary. (Waste Discharge Requirements for the City of Rio Vista Northwest Wastewater Treatment Facility, Order No. R5-2010-0081, at p. F-56.) Considering the discrepancy and inconsistency in findings, the Tentative Permit's new antidegradation analysis here is clearly related to a desire to dictate advanced treatment, rather than compliance with state and federal antidegradation policies. The District fully acknowledges that under state and federal law, the Regional Board has the authority to impose WQBELs in a permit renewal that are more stringent than a prior permit. But there is no authority to use the antidegradation policies or any other state policies to demand implementation of specific technologies for a permitted discharge. (See Wat. Code, § 13360 ["no waste discharge requirement or other order of a regional board . . . shall specify the design, location, type of construction, or particular manner in which compliance may be had . . . ."].)

B. To the Extent the Regional Board Applies Resolution No. 68-16 to Existing Discharges, Such Application Has Not Been Approved Under the Administrative Procedures Act

To the extent that, notwithstanding the inapplicability of the policy to an already-permitted discharge, the Regional Board may assert that it can use the policy here, such assertion is unfounded. It is unlawful to apply or use a policy as a basis of regulation unless the policy has first been proposed, adopted, and approved in accordance with the Administrative Procedures Act (APA). (Gov. Code, § 11340.5.) The antidegradation policies have not been adopted to require analysis for an existing discharge, and application for that purpose would require compliance with the APA.

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[85] The referenced change is presumably the decline of Delta fish populations, which is of course an important issue. However, the issue here is when and how the policy applies. Moreover, there is no suggestion in the Tentative Permit of any "changed conditions" related to many of the constituents the Tentative Permit proposes to regulate more stringently than in the past, such as coliform.

C. The Tentative Permit Proposes Improperly to Use the District's Antidegradation Analysis to Reverse Past Permitting and Allowance of the Permitted Discharge

In February 2005 and on May 20, 2009, the District submitted an "Antidegradation Analysis for Proposed Wastewater Treatment Plant Discharge Modification" (ADA) to support the District's application for a discharge of 218 mgd. By letter dated June 11, 2010, the District withdrew its request for expansion.[86] Once the District's request for expansion was withdrawn, the ADA and its analysis were no longer required. However, the Tentative Permit attempts to use the ADA to argue that the existing discharge is degrading the receiving water. The Tentative Permit's analysis here is flawed for several reasons.

1. Baseline for Existing Water Quality Includes Past-Permitted Discharges

The Tentative Permit asserts that Regional Board staff used information provided in the ADA to evaluate impacts at the permitted discharge flow of 181 mgd, and, for each pollutant, Regional Board staff calculated the amount of reduced assimilative capacity to determine if "increased" pollutant loading was significant. (Tentative Permit at p. F-91.) As already indicated, the Tentative Permit does not allow for an increase in pollutant loading. More importantly, the Tentative Permit proposes to establish a different baseline for the Sacramento region as compared to the rest of the state and as required in state policy. Based on the logic in the Tentative Permit, the baseline for the District is zero discharge, instead of existing water quality (while the baseline for all other activities affecting the Delta is, apparently, current conditions). State Board Guidance provides that, "[b]aseline quality is defined as the best quality of the receiving water that has existed since 1968 when considering Resolution No. 68-16, or since 1975 under the federal policy, *unless subsequent lowering was due to regulatory action consistent with state and federal antidegradation policies*. If poorer water quality was permitted, the most recent water quality resulting from permitted action is the baseline water quality to be considered in any antidegradation analysis." (APU 90-004, at p. 4.) The Tentative Permit and Table F-19 improperly propose to characterize baseline water quality as that being without the District's already permitted discharge. For example, Table F-19 compares the District's already-permitted effluent quality to background river concentrations (i.e., mean Sacramento River concentration at monitoring location RSWU-001 upstream of the SRWTP discharge) to calculate the percent of assimilative capacity used. Such an approach is unprecedented and inconsistent with state policies and guidelines.

[86] The Tentative Permit states that one reason for the withdrawal is a pending legal challenge on the District's EIR for its 2020 Master Plan. This statement is false and any such reference should be removed from the Tentative Permit. The basis for withdrawal of the request for increased permitted capacity is stated in the letter to the Executive Director of the Regional Board from the District Engineer dated June 11, 2010.

In fact, the Tentative Permit's proposed approach treats the Sacramento region different from every other region and discharger in the state. Instead of evaluating a proposed increase in loading, the Tentative Permit evaluates the District's current loading, which has already been permitted, to determine if the District's discharge degrades the receiving water quality. This approach directly contradicts State Board guidance with respect to using existing water quality as the baseline and therefore cannot be supported.

2. The Tentative Permit Does Not Support a Finding That the District's Discharge Is Significantly Degrading Receiving Water

To the extent that the Tentative Permit utilizes the District's ADA to find that the existing permitted discharge is degrading the receiving water and therefore certain specified levels of treatment are required to protect the receiving water, such findings are unfounded, and there are no findings that connect evidence to the conclusions.[87] In this regard, Table F-19 purports to portray the estimated percent of assimilative capacity of the receiving water used by the District with respect to its current discharge. As a preliminary matter, approximately $1 billion worth of new capital costs would be associated with treatment to achieve proposed new effluent limitations for total coliform, yet Table F-19 does not address coliform or assimilative capacity for coliform. (See section I.D, ante.) Table F-19 thus by definition cannot support a finding that the discharge degrades water quality with respect to total coliform. Similarly, the Tentative Permit would impose at $780 million in new capital costs for nitrate removal (see Written Testimony of Hugh Stephen McDonald at p. 5), but Table F-19 shows that the current discharge utilizes zero percent of assimilative capacity for nitrate. In short, the Tentative Permit's sweeping generalization regarding "degradation" based on Table F-19 does not even arguably find support in Table F-19 with respect to major drivers of the costs of the proposed new permit.

The Tentative Permit's assertion also does not withstand scrutiny in the case of other parameters. With the exception of ammonia, bromodichloromethane, and chlorpyrifos, the District's current discharge at its current level of treatment utilizes no more than 10% of assimilative capacity for all other constituents listed. For ammonia in the summer months and bromodichloromethane, the District's current discharge barely exceeds 10%, and is shown as 10.3% and 10.5%, respectively. For many constituents, the actual use of assimilative capacity is significantly lower than 10% and typically below 1%. For high quality waters (i.e., Tier 2 waters under the federal antidegradation policy), the U.S. EPA issued a memorandum discussing Tier 2 antidegradation reviews and significance thresholds as measured by use of available assimilative capacity in the receiving water that states and tribes should consider as requiring an antidegradation analysis that includes consideration of social and economic impacts. (Memorandum from Ephraim S. King, Director, Office of Science and Technology, U.S. EPA, Office of Water, to Water

[87] Apart from the future effects of ammonia on dissolved oxygen levels, information in the ADA supports a finding that the current permitted discharge does not significantly impact water quality in the Sacramento River.

Management Division Directors, Regions 1-10 (Aug. 2005) (King Memorandum).). As discussed in the memorandum, the intent of Tier 2 protection "is to maintain and protect high quality waters and not to allow for any degradation beyond a de minimis level with out having made a demonstration, with opportunity for public input, that such lowering is necessary and important." (*Id*. at p. 1.) U.S. EPA has stated that the use of a 10% reduction in available assimilative capacity as a significance threshold "to be workable and protective in identifying those significant lowerings of water quality that should receive a full Tier 2 antidegradation review, including public participation." (See *Ohio Valley Environmental Coalition v. Horinko* (S.D. W.Va. 2003) 279 F. Supp. 2d 732, 779 [court upheld U.S. EPA's approval of West Virginia antidegradation implementation procedures that include a *de minimis* provision of up to ten percent of the available assimilative capacity for any given pollutant]; see also *Kentucky Waterways Alliance v. Johnson* (6th Cir. 2008) 540 F.3d 466, 486 [court found that "[b]ased on these authorities' [referring, in part, to the King Memorandum] interpretations of the amount of loss of assimilative capacity that would be considered significant, I would find that in order to be considered *de minimus* (and thus permissible as an exception to *40 C.F.R. § 131.12(a)(2)*'s requirement that all Tier II waters be afforded Tier II review), a categorical exemption from Tier II review must not permit any individual discharge that would destroy more than ten percent of a Tier II water's available assimilative capacity."].)

Assuming for the sake of discussion that the "antidegradation" policy applies, the U.S. EPA's significance threshold of 10% should properly be used to determine if a discharge has de minimis effect, or must be accompanied by findings regarding the need to accommodate important economic and social development for an impact above 10%. As described below, the Regional Board has *itself* used this 10% threshold. Table F-19 indicates the threshold is not exceeded for all but 3 constituents and, therefore, the Tentative Permit's finding that the permitted discharge is degrading receiving water is unsupported. At most (again, assuming that the antidegradation policy applies), a Tier 2 analysis may be necessary for chlorpyrifos, bromodichloromethane, and ammonia. However, Tier 2 means only that findings with respect to socioeconomic impacts must be made to allow the degradation—not that advanced treatment is required.

Instead of using the 10% threshold, the Tentative Permit arbitrarily selects and identifies ten different constituents as having the largest impacts on receiving water quality. The range of assimilative capacity used by the constituents identified varies from 0.6% for chloroform to 44.4% for chlorpyrifos. The Tentative Permit identifies ammonia, salinity (in the forms of EC, TDS, and chloride), copper, cyanide, bis(2-ethylhexyl)phthalate, bromodichloromethane, chloroform, and chlorpyrifos as having the largest impacts on the receiving water. Based on the range presented and the number of constituents below the 0.6% of assimilative capacity used for chloroform, it appears that the Tentative Permit uses an *ad hoc* threshold of 0.5% use of available assimilative capacity in the Sacramento River downstream of the SRWTP discharge as

a benchmark, if exceeded, to determine that a particular pollutant in the SRWTP discharge is degrading downstream receiving water quality. A significance threshold of 0.5% is exceptionally low, and in fact, barely below that of upstream, ambient water quality.[88]

The Tentative Permit's use of a 0.5% significance threshold for an existing discharge stands in stark contrast to U.S. EPA guidance as well as to previous determinations made by the Regional Board. When it adopted a permit for the City of Yuba City, the Regional Board stated that a complete antidegradation analysis was not required for the discharge (even though a complete antidegradation analysis was performed by the discharger) per APU 90-004, which states that "[a] Regional Board may determine that it is not necessary to do a complete antidegradation analysis" when "[a] Regional Board determines the proposed action will produce minor effects which will not result in a significant reduction of water quality . . . ." The Regional Board also determined that such a finding was consistent with U.S. EPA guidance. (Waste Discharge Requirements for the City of Yuba City, Order No. R5-2007-0134-01, at p. F-72.)

In another example, the Regional Board incorporated and accepted the 10% threshold as a measure of significance for determining those "substantial lowerings of water quality that should receive a full Tier 2 antidegradation review." (Waste Discharge Requirements for the El Dorado Irrigation District, El Dorado Hills Wastewater Treatment Plant Order No. R5-2007-0069, at p. F-57.) In that permit, constituents that were considered to significantly increase concentration or mass downstream (i.e., >10% use of assimilative capacity) were subject to an alternatives analysis to determine if the proposed action would be in the best socioeconomic interest of the people of the region, and to the maximum benefit to the people of the state. (*Id*. at pp. F-57 - F-58.) Ultimately, the Regional Board determined that the additional degradation was in the best socioeconomic interest and approved the action. Note that this action was for an increased discharge to an effluent dominated waterway—not renewal for an existing discharge to the Sacramento River.

D. The Tentative Permit's Proposal to Reverse Past-Permitted Discharges Is Unreasonable

Even if the Regional Board is able to adopt permit requirements based on Resolution No. 68-16 that are designed to reverse past-permitted change in water quality, such requirements here are unreasonable and conflict with the general policies of Porter-Cologne. The State Board has held that, "[r]esolution No. 68-16 is not a 'zero-discharge' standard but rather a policy statement that existing quality be maintained when it is *reasonable* to do so." (State Board Order No. WQ 86-8, at p. 29.) The State Board further declared that "[t]he resolution is consistent with

[88] If this presumed 0.5% significance threshold is in effect, it is unclear why the Tentative Permit did not identify zinc—reported as using 0.9% of the available assimilative capacity downstream of the SRWTP discharge—as having a notable impact on receiving water quality.

state statutes," including Water code section 13000. (*Ibid*.) Water Code section 13000 states, "[a]ctivities and factors which may affect the quality of the waters of the state shall be regulated to attain the highest water quality which is reasonable, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible." (Wat. Code, § 13000.)

To comply with the reasonableness requirements of Porter-Cologne and Resolution No. 68-16, the Regional Board would (if the policy were applicable) need to find that requiring nitrification, denitrification, and the equivalent of Title 22 filtration with ultraviolet light or chlorine disinfection is reasonable. Here, the Tentative Permit fails to conduct the requisite analysis to make such a finding, and further, based on overwhelming evidence in the record, it would be impossible to do so.

Meeting proposed treatment requirements identified as BPTC in the Tentative Permit would cost the Sacramento region over $2 billon. (Tentative Permit at p. F-93; Written Testimony of Hugh Stephen McDonald at p. 5.) This equates to an approximate 309% increase in monthly residential sewer rates for existing ratepayers and an increase of approximately 464% for in-fill development fees and 470% increase for new development fees.[89] The socioeconomic impacts of the increased costs for existing and new ratepayers would be significant. (See section IV.E.1.a, post.) In contrast, the environmental benefit is negligible, or at most speculative. The District's actual impact to water quality is not significant and, with the exceptions of ammonia impacts on dissolved oxygen, does not cause or contribute to an exceedance of water quality objectives in the Sacramento River outside the boundaries of a well-defined, small and approvable mixing zone. The issues pertaining to dissolved oxygen can be resolved through implementation of ammonia load reductions as a separate requirement of the permit. (See section II.B.2, ante.) Thus, when the socioeconomic impacts to the Sacramento region are compared to the actual environmental impact, the proposed BPTC requirements are unreasonable and unsupportable.

Additionally, it should also be noted that advanced wastewater treatment processes produce environmental impacts in the forms of increased power consumption, associated increases in greenhouse gas emissions, and "cross media impacts." Cross media impacts is a term that refers to the interrelated impacts caused by removal of a constituent from one medium and its transfer to one or more other media. Certain constituents, such as metals, are not destroyed, but transferred from one medium to another. Organic constituents can be destroyed or converted to other toxic or non-toxic forms and can also be transferred from one medium to another. In transferring from one medium to another, the concentration and/or bioavailability of the constituent may be changed significantly. Microfiltration results in the transfer of constituents

[89] The percent increases are based on estimated rates and fees calculated from planning level costs in the Carollo Technical Memorandum Advanced Treatment Alternatives for the SRWTP (2009). The specific rates and fees to be paid by District customers would depend on treatment technologies employed to achieve compliance with all new requirements, but the planning level costs are representative.

from wastewater into biosolids, air, and/or concentrated waste streams. Nitrification and denitrification processes result in the transfer of constituents from wastewater into biosolids. Depending on regulatory limits, additional treatment of the biosolids, air, and/or concentrated waste streams may be required. While the monetary costs of advanced treatment implementation have been estimated, the associated environmental impacts of advanced treatment due to increased power consumption and cross media impacts must also be considered when evaluating the overall impact of advanced treatment implementation at SRWTP. The operation of each advanced treatment process would increase electricity consumption, and thus greenhouse gas emissions above those generated by existing SRWTP secondary treatment processes. While not quantified, these environmental impacts must be considered as costs and consequences associated with advanced treatment.

E. The Tentative Permit's Findings for BPTC Fail to Comply with State and Federal Antidegradation Policies

1. The Proposed Requirements Are Not BPTC

Resolution No. 68-16 applies to waters of the state where the existing quality of water is higher than established policies (i.e., is better than necessary to support existing beneficial uses), and sets forth the circumstances under which change to existing high quality waters will be allowed. (State Board Order No. WQ 86-8, at p. 28.) The determination of "high-quality" water is pollutant specific—not water body specific. (APU 90-004.) When there is high-quality water (for each individually specified pollutant), any activity which produces or may produce waste or increased volume or concentration of waste, will be required to meet waste discharge requirements that will result in BPTC of the discharge that is necessary to assure that pollution or nuisance will not occur, and that the highest water quality consistent with maximum benefit to people of the state will be maintained. (Resolution No. 68-16.)

As noted previously, the federal antidegradation policy sets forth a three-part test that is triggered when there is a reduction in surface water quality. In general, the federal policy requires states to develop a statewide antidegradation policy and identify methods for implementing the policy. Resolution No. 68-16 is considered to incorporate the federal policy. (See State Board Order No. WQ 86-17, at pp. 17-18.) Like Resolution No. 68-16, the federal policy does not prohibit any changes in water quality. (Attwater Memo re: Federal Antidegradation Policy at p. 10.) It sets forth three tiers for protection: Tier 1 requires protection of existing instream water uses and is intended to be a baseline to ensure that existing uses be maintained; Tier 2 requires that where water quality exceeds levels necessary to support beneficial uses (i.e., is better than necessary), water quality shall be maintained and protected unless allowing lower water quality is necessary to accommodate important economic or social development in the area where the waters are located; and, Tier 3, which applies to outstanding national resource waters (ONRW). (40 C.F.R. § 131.12(a).) Although the Delta is an important water body, it is not a designated ONRW and therefore Tier 3 does not apply. Tier 1 is to ensure that existing beneficial uses will be protected and generally applies to new dischargers or increased pollutant loads being discharged to waters

that do not exceed levels necessary to support beneficial uses (i.e., less than water quality objectives). Tier 2 is a public interest balancing test that implies the greater the impact on water quality the greater the justification for the need to accommodate economic or social development. (Attwater Memo re: Federal Antidegradation Policy at p. 12.) The impact to water quality to maintain the existing permitted discharge is negligible. However, the socioeconomic impacts of requiring over $2 billion of new treatment are significant. Further, the federal antidegradation policy itself does not specifically include a requirement pertaining to BPTC except as it relates generally to a public interest balancing test.

Resolution No. 68-16 does not define BPTC. What constitutes BPTC for a particular discharge depends on the circumstances of that discharge and several factors. Further, what constitutes BPTC is guided by the reasonableness standard. (State Board Order No. WQ 86-8, at p. 29.) The State Board has also held that, "[o]ne factor to be considered in determining best practicable treatment or control would be the water quality achieved by other similarly situated dischargers and the methods used to achieve that water quality. Information concerning alternatives and costs of alternatives is relevant to determining compliance with Resolution 68-16." (*In the Matter of the Petition of San Luis Obispo Gold and Country Club*, State Board Order No. WQ 2000-07, at pp. 10-11.) The State Board continued, noting that "[w]hile the Regional Water Board may not specify the manner of compliance with waste discharge requirements, however, it must consider 'best practicable treatment or control' of the discharge. The Regional Water Board should require the [discharger] to consider additional methods that will control the discharge, including methods used by other similarly situated dischargers, in determining the appropriate effluent limitations." (*Id*. at p. 12.)

While BPTC is not expressly defined, there is analogous guidance in the Clean Water Act (CWA). The CWA requires development of effluent limitations requiring application of "the best practicable control technology currently available as defined by the Administrator." (33 U.S.C. § 1311(b)(1)(A.) "Best practicable control technology currently available" is determined based on several factors, including, "the total cost of application of technology related to the effluent reduction benefits to be achieved from such application, and shall also take into account the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, non-water quality environmental impact (including energy impacts), and other factors as the Administrator deems appropriate." (*Id*. at § 1314(b)(1)(B).) Thus, these factors may be applicable to determine BPTC, which is analogous to best practicable control technology currently available.

Here, the Tentative Permit argues that BPTC for the SRWTP includes implementation of nitrification, denitrification, and the equivalent of Title 22 filtration with ultraviolet light or chlorine disinfection treatment. (Tentative Permit at pp. F-91, K-11.) However, the finding provides no analysis as to why these requirements constitute BPTC, as to why these requirements are reasonable, or, why they are necessary to assure that pollution or nuisance will not occur. Further, the Tentative Permit fails to establish the existence of a benefit, and in fact

expresses uncertainty that such benefit exists, associated with the required additional treatment. (See sections I-III, ante.)

To make a determination of BPTC, the Regional Board must first conduct a complete antidegradation analysis considering both Resolution No. 68-16 and the federal antidegradation policy. As a means to assist regional boards in such an analysis, the State Board issued APU 90-004. APU 90-004 provides guidance as to when an antidegradation analysis is required, what it consists of, and how it should be completed. It states that when a regional board performs an antidegradation analysis, the Regional Board must perform the 3 following steps:

1. Compare receiving water quality to the water quality objectives established to protect designated beneficial uses.
2. Balancing the proposed action against the public interest.
3. Report on the antidegradation analysis.

The Tentative Permit does not include an appropriate complete antidegradation analysis to support its BPTC conclusions. Specifically, and as discussed previously, the Tentative Permit purports to conduct step 1 in Table F-19, but draws sweeping conclusions that are inconsistent with existing policies and past practice. The Fact Sheet (Attachment F) included as part of the Tentative Permit compares downstream receiving water quality below the SRWTP discharge to established water quality objectives. However, the Tentative Permit does not report the Regional Board's proposed findings on the balancing of the proposed action against the public interest as is required in step 2. Such a finding is necessary to ensure compliance with both state and federal antidegradation policies (i.e., to the maximum benefit of the public, and necessary to accommodate important economic or social development in the area). Further, a review of the permit records fails to find such an analysis. Had such an analysis been performed, the conclusions in the Tentative Permit with respect to BPTC would be entirely different than those proposed. It is not sufficient for the Regional Board to rely on the District's ADA that was submitted on May 20, 2009, because the ADA's socioeconomic impacts analysis only evaluated advanced treatment of SRWTP effluent that would remove the mass loading increment from 181 mgd to 218 mgd. The District's 2009 ADA did not evaluate the socioeconomic impacts of full nitrification, full denitrification, and the equivalent of Title 22 filtration with ultraviolet light or chlorine disinfection for a 181 mgd discharge. Finally, although the Tentative Permit includes some vague findings, it does not include a proper full antidegradation analysis. Respectfully, the Tentative Permit's analysis is far, far removed from what the Regional Board would require of a regulated party.

a. Proper Evaluation of BPTC Would Lead Regional Board to Different Conclusions

Typically, when determining if an increased load in a pollutant to a high quality water should be allowed, the Regional Board must determine if the discharge is necessary to accommodate social or economic development and is consistent with maximum public benefit.[90] In making such a determination, State Board guidance provides that the following factors be considered:

> a. Past, present, and probable beneficial uses of water.
>
> b. Economic and social costs, tangible and intangible, of the proposed discharge compared to benefits. The economic impacts to be considered are those incurred in order to maintain existing water quality. The financial impact analysis should focus on the ability of the facility to pay for the necessary treatment. The ability to pay depends on the facility's source of funds. In addition to demonstrating a financial impact on the publicly- or privately-owned facility, the analysis must show a significant adverse impact on the community. The long-term and short-term socioeconomic impacts of maintaining existing water quality must be considered. *Examples of social and economic parameters that could be affected are employment, housing, community services, income, tax revenues, and land value. To accurately assess the impact of the proposed project, the projected baseline socioeconomic profile of the affected community without the project should be compared to the projected profile with the project*.
>
> c. The environmental aspects of the proposed discharge must be evaluated. The proposed discharge—while actually causing reduction in water quality in the given water body—may be simultaneously causing an increase in water quality in a more sensitive body of water from which the discharge in question is being diverted; e.g., changing the location of San Francisco's outfall from the Bay to the ocean.
>
> d. The implementation of feasible alternative control measures which might reduce, eliminate, or compensate for negative impacts of the proposed action. (APU 90-004, at p. 5, emphasis added.)

[90] The phrase "necessary to accommodate important economic or social development" is included in the federal Antidegradation Policy (40 C.F.R. § 131.12(a)(2)), but not in Resolution No. 68-16. Where the federal antidegradation policy applies, Resolution No. 68-16 incorporates the tests from the federal antidegradation policy to determine if changes in water quality are consistent with the maximum benefit to the people of the state. (State Board Order No. 86-17, at p. 17.)

In this case, although the Tentative Permit is not proposing to permit an increased load in a pollutant (or pollutants), if an antidegradation analysis is proper, the Regional Board must consider the factors above in determining if full nitrification, full denitrification, and equivalent of Title 22 filtration qualify as BPTC. Specifically, the Regional Board must find that the proposed requirements do not unduly impact social and economic development and are to the maximum benefit to the people of the state. If the Regional Board had actually properly considered the factors described above, the Regional Board would *not* be able to find that full nitrification, full denitrification, and equivalent of Title 22 filtration constitute BPTC for this discharge.

For example, although the Tentative Permit appears to identify economic impacts at a gross level (e.g., Table F-18), the Tentative Permit makes no attempt to evaluate the social and economic impacts of requiring over $2 billion for construction of new advanced treatment facilities on the Sacramento region. Further, the Tentative Permit ignores the analysis provided in the Technical Memorandum: Analysis of Costs and Benefits of Advanced Treatment Alternatives for the Sacramento Regional Wastewater Treatment Plant (Cost/Benefits Analysis), which was submitted to the Regional Board in May 2010. This report evaluated the cost of implementing five advanced treatment trains and the changes in downstream water quality that these treatment trains could achieve. The report evaluated full nitrification, full denitrification, filtration, and UV disinfection, as well as reverse osmosis, ozone/peroxide oxidation, and combinations of these various treatment processes, and concluded that the high costs associated with the implementation of advanced treatment of SRWTP secondary treated effluent discharged at the once proposed rate of 218 mgd are disproportionate to the water quality benefits that may be observed in downstream receiving waters with implementation of advanced treatment. (Cost/Benefits Analysis at p. 5-2.) Considering that the District withdrew its request to increase the SRWTP capacity from 181 mgd to 218 mgd, the increment of pollution reduction due to implementation of advanced treatment of a 181 mgd discharge would be even smaller than the increment in pollution reduction modeled for a 218 mgd discharge, and as stated above, the change in downstream water quality with implementation of advanced treatment at a SRWTP flow rate of 218 mgd was found not to be commensurate with the cost of advanced treatment. The conclusion in the report was made because the minor, and in some cases immeasurable reductions in downstream receiving water constituent concentrations as a result of implementation of the advanced treatment train alternatives are disproportionate to the high capital and total annual costs of implementation of advanced treatment.

A study prepared by the University of the Pacific (UOP) evaluated the socioeconomic impacts of implementing nutrient removal for a SRWTP discharge rate of 218 mgd, and found that nutrient removal of the SRWTP discharge is estimated to lead to an annual income loss of $94.4 million and an annual employment loss of 390 jobs in the District's service area, which covers most of

Sacramento County.[91] (Michael, Jeffrey Dr., Dr. Thomas Pogue, Business Forecasting Data, Eberhardt School of Business UOP, Advanced Wastewater Treatment for Nutrient Reduction: Impact on Sacramento Income and Employment (Aug. 23, 2010) (UOP Report) at p. 8.) These socioeconomic impacts would occur each year for the 30-year lifecycle estimated for the nutrient reduction advanced treatment process upgrade to the SRWTP. (*Ibid*.) The impacts stated above include positive job gains and the infusion of dollars into the local economy due to a 5-year construction period for the SRWTP upgrade. (*Ibid*.) Thus, the stated impacts represent net negative socioeconomic impacts to the District's service area. The UOP study reported that the primary impact due to implementation of nutrient reduction is a loss of disposable income distributed broadly across Sacramento households, with over half of the loss falling on households with annual incomes below $50,000. (*Ibid*.) The study also stated that the estimated impacts were conservative, and the implementation of further advanced treatment, such as filtration to reduce other contaminants, would more than double the costs and socioeconomic impacts estimated in the report. (*Id*. at p. 9.)

Besides failing to consider the social and economic impacts on the Sacramento region, the Tentative Permit also fails to consider the implementation of feasible alternative control measures that might counteract the negative impacts of the District's discharge. Specifically, the District submits that full nitrification and full denitrification are not necessary to protect beneficial uses in the Sacramento River and the Delta. In its LDOPA report, the District finds it necessary to remove some additional amount of oxygen demanding material (presumably ammonia) from the effluent to ensure future compliance with dissolved oxygen standards and to protect beneficial uses. (Section II.B.2, ante.) However, it is not necessary to require full nitrification to achieve the dissolved oxygen objectives in the Lower Sacramento River. (Section II, ante.)

With respect to the requirement for full denitrification of fully nitrified SRWTP effluent, it appears counterintuitive to reduce nitrate from a system that is believed to be characterized by compromised primary productivity that is suggested as having negative impacts on food web dynamics and upper trophic level productivity. The proposal to fully denitrify SRWTP effluent would essentially eliminate SRWTP as a source of nitrate to Suisun Bay, likely reducing phytoplankton bloom potential. The Tentative Permit also states that fully denitrifying SRWTP effluent would maintain, and perhaps reduce, the nitrogen to phosphorus (N:P) ratios in the Sacramento River and Suisun Bay. Adequate scientific information does not exist to understand

[91] The UOP study is limited to the impacts of nutrient removal, which is considered to consist of NTF, FBR and two new pumping stations for a flow rate of 218 mgd. It does not include an assessment of impacts associated with costs for Title 22 or equivalent filtration with ultraviolet light or chlorine disinfection treatment. Although the flow rate in the UOP study is greater than the now permitted 181 mgd, the impacts assessed are still demonstrative and most likely understated because they do not include significant costs for other treatment declared to be BPTC in the Tentative Permit.

the impact or benefit of either maintenance or reduction of N:P ratios downstream of the SRWTP discharge, let alone what specific ratio may be desirable. (See section III, ante.)

Further, the Tentative Permit provides no legal support or basis to require full denitrification. There are no existing water quality criteria or objectives that suggest full denitrification is necessary to protect aquatic life beneficial uses in the Sacramento River and Delta. At most, it would be reasonable for the Tentative Permit to consider if effluent from the SRWTP, after additional ammonia removal is implemented, would cause or contribute to a violation of the applicable drinking water maximum contaminant level of 10 mg/L as N. If reasonable potential was found, it would then be appropriate for the Tentative Permit to include a proposed final effluent limitation for nitrate, after the consideration of available dilution, be set to protect the municipal drinking water beneficial use. The limit derived accordingly would determine if it was necessary for the SRWTP to be modified in a manner that includes any denitrification.

The Tentative Permit also fails to properly evaluate the requirement for the equivalent of Title 22 filtration in order to find that it is BPTC. Although filtration is an available technology, its application to the District's discharge at the SRWTP is not practicable or reasonable. As discussed in section I, ante, the Sacramento River upstream of the SRWTP discharge does not meet Title 22 tertiary standards. Treating SRWTP effluent to Title 22 tertiary standards will not bring the Sacramento River downstream of the SRWTP discharge into compliance with Title 22 standards. In fact, if the issue is evaluating the effect on "high quality" water and the standard under consideration is 2.2 MPN/100 ml (Title 22 tertiary equivalent), the receiving water would not be "high quality" and Resolution No. 68-16 does not apply. Further, as previously explained, the benefits to water quality from requiring filtration are limited and are not commensurate with the cost of building and operating these treatment facilities. These issues are described more fully in section I, and that discussion is incorporated by reference here.

Additionally, the Tentative Permit fails to include any findings as to why the proposed treatments are necessary to assure that pollution or nuisance will not occur.[92]

[92] "Pollution" means an alteration of water quality to a degree that unreasonably affects beneficial uses, or facilities which serve the beneficial uses. (Wat. Code, § 13050(l).) No evidence supports a finding of pollution or nuisance.

2. The Tentative Permit's "Reasons" for Declaring Full Nitrification, Full Denitrification and Equivalent of Title 22 Filtration as Being BPTC Are Not Proper Findings and Are Inconsistent with State and Federal Antidegradation Policies

a. Bullet Points Are Not a BPTC Analysis

In an effort to claim that the identified levels of treatment constitute BPTC, the Tentative Permit includes a series of bullet points. (Tentative Permit at pp. F-91 - F-92.) However, these statements are not proper findings, and more importantly, they fail to actually support the Tentative Permit's conclusion. These findings also fail to meet "Report on the Antidegradation Analysis" provisions specified in APU 90-004, which states that the antidegradation analysis should be summarized in the fact sheet and include all of the following: water quality parameters and beneficial uses which will be affected by the proposed action and the extent of the impact; scientific rationale for determining the proposed action will or will not lower water quality; description of the alternative measures that were considered; a description of socioeconomic evaluation; and the rationale for determining that the proposed action is or is not justified by socioeconomic considerations. (APU 90-004, at p. 6.) For example, the first four statements in the list of bullet points are merely statements of fact. No one disputes the importance of the Sacramento River and the Sacramento-San Joaquin Delta, or the fact that the Delta is an important environmental and economic resource for the state. However, none of these four statements provide any evidence to suggest that the District's existing discharge is negatively affecting these beneficial uses, or that the proposed treatment requirements are reasonable. Further, the specific values used in these bullet points significantly overstate both the number of people affected and the actual level of impact, if any, to those people.

The next statement, "[a]mmonia, along with BOD, from the SRWTP reduces the dissolved oxygen in the Sacramento River and Sacramento-San Joaquin Delta for nearly 40 miles below its discharge," again is a statement of fact. To the extent that discharges from the SRWTP do reduce dissolved oxygen in the Sacramento River and Delta downstream of the SRWTP discharge, the District proposes to comply with a UOD limit that will ensure future compliance with dissolved oxygen water quality objectives under all projected critical river flow and temperature conditions. By complying with a UOD limit, the District will need to decrease the levels of ammonia and/or BOD in its discharge. However, compliance with UOD limits and ensuring that the receiving water meets dissolved oxygen objectives does not result in the need for full nitrification of effluent from SRWTP. Thus, this statement fails to support full nitrification as being necessary to ensure compliance with dissolved oxygen water quality objectives.

The second sentence of this statement, "[t]he oxygen depleting constituents from the SRWTP use or will use all the assimilative capacity of the River and Delta leaving no assimilative capacity available to other communities that currently reduce oxygen demanding constituents by implementing advanced treatment processes," has no relevance here and is highly misleading. First, the District is not requesting or proposing an increase in discharge, and therefore it does

not seek to use additional assimilative capacity beyond what has been permitted previously. Second, the District proposes to comply with a UOD limit that will ensure compliance with applicable dissolved oxygen water quality objectives. Thus, the claim that the District is using assimilative capacity that should be available to others has no bearing on dissolved oxygen levels in the Sacramento River and the Delta. Moreover, this reference is misleading. In the case of other dischargers listed in Attachment K, it is physically impossible for some of the listed discharges to affect dissolved oxygen in the area of interest because their effluents do not reach the lower Sacramento River. Also, none of these entities have ever been regulated based on impacts to dissolved oxygen in this area, and it is unlikely they will be. Further, the District's proposed UOD load limit takes as a given other impacts that occur from other activities in the watershed that impact DO levels downstream of the SRWTP.

Next, the Tentative Permit includes three statements regarding ammonia from the SRWTP and its impact on the Delta: "The ammonia from the SRWTP contributes to the water quality problems in the Suisun Bay"; "The ammonia from the SRWTP may be acutely or chronically toxic to species, including copepods and freshwater mussels that reside in the Sacramento River and Sacramento-San Joaquin Delta"; and, "Ammonia in the SRWTP effluent combined with chlorine disinfection creates nitrosamines at levels 100 times greater than the primary MCL. Nitrosamines are highly mutagenic and potentially carcinogenic." (Tentative Permit at p. F-92.) These conclusory statements fail to support the finding that full nitrification is BPTC. (See sections II-III, ante, for detailed information on this topic.)[93]

Following the statements regarding ammonia are two statements pertaining to the proposed equivalent to Title 22 filtration requirement. These issues are addressed fully in section I, ante, and other materials provided by the District.

The Tentative Permit includes a generic statement that "reduction or elimination of ammonia, nitrate and protozoans will reduce impacts to the beneficial uses of the Sacramento River and Sacramento-San Joaquin Delta from SRWTP discharge." However, the Tentative Permit provides no evidence that in fact advanced treatment of the SRWTP discharge provides tangible or certain benefits or otherwise leads to improved attainment of beneficial uses. As described previously in sections I, II, and III, ante, there is a lack of evidence that such benefits will occur.

The last two statements in the Tentative Permit are apparently designed to find that treatment requirements proposed are the same as other similarly situated dischargers. (Tentative Permit at p. F-92; see State Board Order No. WQ 2000-07, at pp. 10-11 ["One factor to be considered in determining best practicable treatment or control would be the water quality achieved by other

[93] The Tentative Permit here also references a June 4, 2010, letter from the San Francisco Regional Water Quality Control Board. (Tentative Permit, p. F-92, fn. 2.) That letter does not appear to contain the specific statement for which it is cited. In any event, it reflects no original scientific analysis. The District has addressed the letter from Region 2 in its letter to Mr. Landau dated August 12, 2010.

similarly situated dischargers and the methods used to achieve that water quality."].) Along with these statements, the Tentative Permit includes Table F-18. (*Id*. at p. F-93.) The comparisons here are inaccurate and do not represent a comparison to "other similarly situated dischargers," as discussed below.

b. Table F-18; Other Dischargers

The District strongly objects to Table F-18, for many reasons. First, the Tentative Permit states in a footnote that the Table is based on a "telephone survey." There was no survey conducted. Rather, Regional Board staff selected and called certain specific municipal dischargers for information.[94] Regional Board staff did not even speak to each of the entities listed in Table F-18, and in some instances staff provided the information in the table for a discharger without even having spoken to the discharger at all. There is no indication, anywhere, of what questions were asked, what the specific answers were, why these individual entities were chosen for "surveying" or why they are "similarly situated" to the District. Further, assuming that the goal of the "survey" was in some way to gather information regarding the costs of compliance with post-secondary treatment, an objective survey would have revealed the answer to be zero for many municipal dischargers. The purported survey identifies a "per capita" cost that is not based on appropriate information such as costs that have actually been incurred, financing methods, allocation among existing, new, and industrial users, or other factors that would affect the actual costs to residents, or the actual impacts in the specific community under consideration.

In fact, most of the examples provided are POTWs that discharge to effluent dominated waterways (small creeks and sloughs) where dilution does not occur during critical low flow periods (e.g., Roseville, Davis, Lodi, Woodland, and Vacaville). None of these communities discharge directly to the Sacramento River. It is not unlikely that, absent WQBELs driving high treatment costs, these entities would have been considered to use more than 100% of the assimilative capacity of their immediate receiving waters, a situation vastly different than the District. There are also assumptions inherent in Table F-18 that are not valid. For example, it is the District's understanding that costs for Davis would include new secondary treatment as well, and further that Davis is pursuing other options in order that it not have to incur the costs suggested by Table F-18. As another example, relatively speaking, Roseville has a greater market for recycled water use than the District. With respect to Manteca and Tracy, these two entities discharge to the San Joaquin River or its tributaries—not the Sacramento River, and the

[94] Subsequent to the issuance of the Tentative Permit, District representatives visited the Regional Board on September 21, 2010 to, among other things, acquire the survey or information regarding the survey. The only information available was an email response from Larry Parlin with the City of Stockton, and an excel file that replicates Table F-18. Subsequently, Regional Board staff prepared a memo for file dated September 30, 2010, which is nearly four weeks after release of the Tentative Permit. The memo to file merely states that a telephone survey was conducted in July of 2010. It does not include or identify the questions asked to the various contacts from the other POTWs, or document the responses given.

hydrologic circumstances are also quite dissimilar. Further, both of these entities decided to install advanced treatment processes in conjunction with capacity increases based on localized water quality conditions and regulatory constraints. Ironhouse Sanitary District discharges seasonally to the San Joaquin River in the western Delta, and applies recycled water in the summer months to adjacent agricultural lands. For its discharge to the San Joaquin River, Ironhouse is a new discharger. It elected to propose treatment beyond secondary treatment for its "new" discharge to the Delta, approved in 2008.

In comparison, the cities of Yuba City, Corning, and Chico all discharge to mainstem rivers tributary to the Delta where significant dilution is available. For these cities, the Regional Board has adopted effluent limits that are consistent with secondary treatment standards and that do not require implementation of filtration, nitrification, or denitrification. (See Waste Discharge Requirements for the City of Corning, Corning Wastewater Treatment Plant, Order No. R5-2010-0080 (Corning Permit), at p. 11; see also Waste Discharge Requirements for the City of Chico, Chico Water Pollution Control Plant, Order No. R5-2010-0019 (Chico Permit), at p. 11; see also Waste Discharge Requirements for the City of Yuba City, Wastewater Treatment Facility, Order No. R5-2007-0134-01 (Yuba City Permit), at p. 11.) Further, the Regional Board has found that compliance with these secondary treatment requirements will result in "the use of best practicable treatment or control of the discharge." (Chico Permit at p. F-39; Yuba City Permit at p. F-78; see also Corning Permit at p. F-46 where the Regional Board finds that the discharge is consistent with Resolution No. 68-16 and the federal antidegradation policy.)[95]

None of the entities listed in the Tentative Permit are "similarly situated" dischargers. The Tentative Permit does not explain why they are or why others (e.g., Yuba City, Chico, Corning) are not. The entities listed in the Tentative Permit are simply dischargers selected for presentation in a table, with no objective basis for selection. Table F-18 does not support any finding relative to the permit renewal, and must be deleted. Consideration of dischargers who actually are similarly situated reinforces that proposed new treatment requirements that would result from adoption of the proposed effluent limits is not BPTC for the SRWTP.

V. MIXING ZONES

On pages F-29 through F-44, the Tentative Permit addresses mixing zones. The Tentative Permit appears to acknowledge the State's *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (SIP), the Basin Plan, and *U.S. EPA's Technical Support Document for Water Quality-Based Toxics Control* (TSD)[96] as the

[95] The Corning Permit includes a reference to further discussion in the Fact Sheet, however, no such discussion is available.

[96] U.S. EPA Technical Support Document for Water Quality-Based Toxics Control (EPA/505/2-90-001).

appropriate regulations and guidance for the establishment of appropriate mixing zones. In accordance with applicable mixing zone policy, regulations and guidance, the District provided extensive documentation and evidence to support a proposed 60-foot long acute mixing zone, a 350-foot long chronic mixing zone[97], and a harmonic mean flow human health mixing zone at the point where complete mixing of the SRWTP effluent and Sacramento River occurs, approximately three miles downstream from the discharge point. (LWA SRCSD (June 2010).[98]) However, despite the overwhelming and complete evidence submitted by the District, the Tentative Permit proposes to deny an acute mixing zone altogether, and denies granting mixing zones and dilution credits for specific compounds. Although the Regional Board has some discretion in granting mixing zones and dilution credits, it must explain any denial of a mixing zone based on consideration of the facts of the discharge. (*In the Matter of the Petition of Yuba City*, State Board Order WQO 2004-0013, at p. 10.) The information contained in the Tentative Permit in fact fails to provide proper justification for denial of an acute mixing zone, and for denial of dilution credits for specific constituents. (Tentative Permit at pp. F-29 - F-44.) As such, those denials are inappropriate and the mixing zones should be allowed.

In numerous cases, and where appropriate, the Regional Board has approved mixing zones in NPDES permits. Table V.1 is a list of dischargers with approved mixing zones as described in NPDES permits. As listed in Table V.1, Central Valley dischargers with approved mixing zones may have different combinations of approved acute, chronic, and human health mixing zones for a variety of reasons. Additionally, several of the Dischargers listed in Table V.1 discharge to the Sacramento River and are similarly situated to the SRWTP discharge. All of the dischargers listed in Table V.1 were granted acute, chronic, and human health mixing zones by the Regional Board. From the information presented in Table V.1, prior to the issuance of the District's Tentative Permit, it has been the policy of the Regional Board to grant acute, chronic, and human health mixing zones as appropriate for specific discharges.

Table V.1: Central Valley Region Dischargers with Waste Discharge Requirements That Include a Dilution Credit/Mixing Zone.

Discharger	Order No.	Receiving Water	Dilution Credit/Mixing Zone
Anderson, City of	R5-2007-0167	Sacramento River	307:1 (acute), 948:1 (chronic), 3485:1 (human health)
Angels, City of	R5-2009-0074	Angels Creek	9:1 (acute), 18:1 (chronic and human health)
Chester Public Utilities District	R5-2009-0078	Lake Almanor	7:1 (acute and chronic)

[97] Technical Memorandum, "Mixing Zones and the Prevention of Acutely Toxic Conditions," to Bob Seyfried and Vyomini Pandya SRCSD (July 13, 2009).

[98] SRCSD, "Sacramento River Harmonic Mean Mixing Zone Report", Larry Walker Associates (June 2010).

Discharger	Order No.	Receiving Water	Dilution Credit/Mixing Zone
Chico, City of	R5-2010-0019	Sacramento River	20:1 (acute and chronic, ammonia), 47:1 (acute and chronic, copper), 88:1 (human health)
Corning, City of	R5-2010-0080	Sacramento River	10:1 (acute, chronic, human health)
Cottonwood WWTP	R5-2010-0044	Cottonwood Creek	Varies by constituent; ranges from 5:1 to 20:1; most common 5.5:1
Discovery Bay CSD, Town of	R5-2008-0179	Old River	13.2:1 (acute), 23:1 (chronic)
Ironhouse Sanitary District	R5-2008-0057	San Joaquin River	20:1 (acute), 28:1 (chronic), 1000:1 (human health)
Manteca, City of	R5-2009-0095	San Joaquin River	93:1 (human health at 9.87 mgd), 52:1 (human health at 17.5 mgd)
Mt. Shasta WWTP, City of	R5-2007-0056	Upper Sacramento River	10:1 (chronic)
Portola, City of	R5-2009-0093	Middle Fork, Feather River	20:1 (acute and chronic)
Red Bluff, City of	R5-2007-0041	Sacramento River	29:1 (acute, chronic, human health)
Redding, City of	R5-2007-0058	Sacramento River	148:1 (acute), 155:1 (chronic), 1077:1 (human health)
Rio Vista Beach WWTF, City of	R5-2008-0108-01	Sacramento River	20:1 (acute and chronic), 1000:1 (human health)
Rio Vista Northwest WWTF, City of	R5-2010-0081	Sacramento River	20:1 (acute and chronic), 1000:1 (human health)
Sewerage Commission – Oroville Region	R5-2010-0073	Feather River	20:1 (acute and human health), 26:1 (chronic)
Shasta Lake, City of	R5-2008-0037	Churn Creek (tributary to Sacramento River)	5:1 (acute and chronic), 10:1 (human health)
Tuolumne Utilities District	R5-2008-0162	Woods Creek	20:1 (human health)
Turlock, City of	R5-2010-0002	San Joaquin River	19.9:1 (human health)
Yuba City, City of	R5-2007-0134-01	Feather River	11:1 (acute), 12:1 (chronic), 221:1 (human health)

Generally, in accordance with the TSD, mixing zones are allocated for types of criteria or objectives. For example, the acute mixing zone is allocated for acute aquatic toxicity criteria, and a chronic mixing zone is allocated for chronic aquatic life toxicity criteria. If it can be demonstrated that the acute mixing zone is sufficiently sized to prevent any acute toxicity to organism passing though the zone, the acute mixing zone is considered protective of the aquatic life beneficial use. (SIP at p. 17.) The acute mixing zone dilution should be used to evaluate

acute aquatic life criteria. If there are more stringent limitations (e.g., applicable chronic aquatic life criteria), they may control the final effluent limitations. However, merely because there are more stringent criteria, or treatment performance indicates that the discharge may comply with limits more stringent than the WQBELs calculated with consideration of dilution, denial of any mixing zone without cause is not appropriate. Thus, if the acute mixing zone is sufficiently sized to comply with the SIP, Basin Plan, and U.S. EPA regulations and guidance for ensuring the intended level of protection for the aquatic life beneficial use, the Regional Board should find it appropriate for the discharge and approve it for use in effluent limit derivation.

A. District's Proposed Mixing Zones Are Consistent with SIP, Basin Plan, and U.S. EPA Guidance

The District's diffuser is 300 feet wide, approximately centered in the Sacramento River channel, with the ports near the bottom, aligned parallel with the channel and pointing downstream. The diffuser contains 74 10-inch diameter ports for a combined discharge area of 40.4 square feet. The high rate diffuser is effective at providing rapid mixing of effluent and receiving water. The discharge is considered to be incompletely-mixed and is subject to SIP requirements accordingly. (SIP at pp. 16-17).

Specifically, the SIP outlines the requirements for the establishment of mixing zones for incompletely-mixed discharges as follows:

> A mixing zone shall be as small as practicable. The following conditions must be met in allowing a mixing zone:
>
> A: A mixing zone shall not:
>
> 1. compromise the integrity of the entire water body;
> 2. cause acutely toxic conditions to aquatic life passing through the mixing zone;
> 3. restrict the passage of aquatic life;
> 4. adversely impact biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under federal or State endangered species laws;
> 5. produce undesirable or nuisance aquatic life;
> 6. result in floating debris, oil, or scum;
> 7. produce objectionable color, odor, taste, or turbidity;
> 8. cause objectionable bottom deposits;
> 9. cause nuisance;
> 10. dominate the receiving water body or overlap a mixing zone from different outfalls; or

> 11. be allowed at or near any drinking water intake. A mixing zone is not a source of drinking water. To the extent of any conflict between this determination and the Sources of Drinking Water Policy (Resolution No. 88-63), this SIP supersedes the provisions of that policy.

The SIP states that "[d]ilution credits and mixing zones for incompletely mixed discharges shall be considered by the RWQCB only after the discharger has completed an independent mixing zone study and demonstrated to the satisfaction of the RWQCB that a dilution credit is appropriate." (SIP at p. 17.) The SIP further states that "mixing zone studies may include, but are not limited to, tracer studies, dye studies, modeling studies, and monitoring upstream and downstream of the discharge that characterize the extent of actual dilution." (SIP at p. 17.) Accordingly, the District has conducted and submitted extensive, repeated mixing zone studies to support the granting of acute and chronic mixing zones. The District's mixing zone studies are discussed in the following section, which include modeling studies with tracer studies for calibration and validation. All of the studies performed by the District have been submitted and thoroughly reviewed by Regional Board staff and independent contractors. Based on the information contained in these various studies, the acute mixing zone proposed by the District extends 60 feet downstream from the diffuser, and the chronic mixing zone extends 350 feet. The District has calculated the float time through the acute mixing zone under critical receiving water and effluent flows to require 2.8 minutes[99], which is well below the 15-minute guidance provided in the TSD[100]. The calculated float time is conservative because it is based only on the velocity flow relationship of the river and does not account for the increase in velocity due to discharge of effluent though the diffuser ports. Additionally, the proposed acute mixing zone is within the zone of initial dilution (ZID)[101], complying with the Basin Plan guidance of ". . . small zone of initial dilution in the immediate vicinity of the discharge." (Basin Plan at p. IV-16.00.) Due to the limited duration of exposure over the short distance the defines the mixing zone boundary, an organism floating through the acute mixing zone will not be subjected to acutely toxic conditions.

With respect to meeting the requirements specified in the SIP, the District's proposed acute mixing zone is compliant for the following reasons.

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[99] Technical Memorandum, "Mixing Zones and the Prevention of Acutely Toxic Conditions, to Robert Seyfried and Vyomini Pandya SRCSD (July 13, 2009).

[100] TSD p. 33, In many situations, travel time through the acute mixing zone must be less than roughly 15 minutes if a 1-hour average exposure is not to exceed the acute criterion.

[101] The ZID is where the momentum and buoyancy of the discharged effluent has dissipated and additional dilution occurs through the natural dispersion of the river flow.

1. *Shall not compromise the integrity of the entire water body* - The Sacramento River is approximately 600 feet wide at the surface in the vicinity of the discharge. The proposed mixing zone is 300 feet wide (the width of the diffuser) by 60 feet downstream. The acute mixing zone begins along the bottom of the river at the submerged diffuser and would not reach the river surface. The Sacramento River is a large waterbody extending over 40 miles downstream from the discharge to San Francisco Bay. As the total volume of the mixing zone is small in comparison to the river segment, there is expected to be little effect on the integrity of the waterbody as a whole[102]. The acute mixing zone would not compromise the integrity of the entire waterbody.

2. *Shall not cause acutely toxic conditions to aquatic life passing through the mixing zone* - As outlined above, the acute mixing zone is sized to prevent acutely toxic conditions to aquatic life passing though the acute mixing zone by limiting travel time through the zone to 2.8 minutes[99].

3. *Shall not restrict the passage of aquatic life* - The District's model results demonstrate a zone of passage unoccupied by the partially mixed effluent plume of approximately 100 feet on either side of the mixing zone near the surface and 40 feet on either side near the bottom at the edge of the acute mixing zone. As detailed below, the District performed 6 dye studies to validate the plume model.

4. *Shall not adversely impact biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under federal or State endangered species laws* - The acute mixing zone will not cause acutely toxic conditions, allows adequate zones of passage, and is sized appropriately to ensure that there will be no adverse impacts to biologically sensitive or critical habitats.

5 - 9. *Shall not produce undesirable or nuisance aquatic life*; *result in floating debris, oil, or scum; produce objectionable color, odor, taste, or turbidity*; *cause objectionable bottom deposits; cause nuisance* - Currently, there are no undesirable or nuisance aquatic life, floating debris, oil or scum, and there is no objectionable color, odor, taste, or turbidity produced by the SRWTP discharge through the diffuser. The SRWTP discharge contains low solids and therefore it will not cause objectionable bottom deposits or cause nuisance. Allowance of a mixing zone for acute aquatic life criteria will not cause any of these conditions.

[102] TSO, p. 34, If the total area affected by elevated concentrations within all mixing zones combined is small compared to the total area of a waterbody (such as a river segment) then mixing zones are likely to have little effect on the integrity of the waterbody as a whole, provided that they do not impinge on unique or critical habitats.

10. *Shall not dominate the receiving water body or overlap a mixing zone from different outfalls* - The proposed acute mixing zone is small relative to the waterbody. There are no other permitted discharges or mixing zones in the area of the discharge; therefore, the proposed acute mixing zone does not overlap mixing zones from different outfalls.

11. *Shall not be allowed at or near any drinking water intake. A mixing zone is not a source of drinking water* - The proposed acute mixing zone is not near a drinking water intake. The Freeport Regional Water Authority (FRWA) intake is located 1 mile upstream from the discharge and is not affected by the discharge. The closest downstream diversion from the Sacramento River leading to the Barker Slough Pumping Plant drinking water intake is approximately 33 miles downstream along the Sacramento River and an additional 11 miles away along the Ship Channel and Barker Slough from the District's proposed acute mixing zone.

More importantly, beneficial uses will not be adversely affected by the granting of an acute mixing zone. As the acute mixing zone is applied only to acute aquatic life criteria for the protection of aquatic life, and the acute mixing zone is sized to prevent acutely toxic conditions from occurring to organisms floating through, there are no impacts to beneficial uses.

With respect to the chronic and human-health mixing zones, the District generally agrees with the Tentative Permit's assessment of the chronic and human health mixing zones as complying with SIP, Basin Plan, and U.S. EPA requirements and guidance. (See Tentative Permit at pp. F-35 - F-37 [Tentative Permit makes all the necessary findings for chronic mixing zone].) However, the Regional Board's denial of acute and/or chronic dilution credits for ammonia, copper, cyanide, and chlorpyrifos is inappropriate and not supported by evidence in the record or the logic provided in the Tentative Permit. The District's comments on denial of credits for these specific constituents is provided in section VI, post.

B. Regional Board Staff Accepted the District's Model

The District has devoted considerable resources to ensure the evaluation of available mixing and sizing of the proposed mixing zones were conducted in a sound and scientifically defensible manner. As described in the Tentative Permit, the dynamic modeling tool developed by the District is composed of four main parts: PROSIM to determine the monthly flows and temperatures in the Sacramento River, Fischer Delta Model (FDM) and longitudinal dispersion model (LDM) to convert the monthly flows to hourly flows taking the tidal cycle and reverse flows into consideration, FLOWMOD to calculate 3-D mixing and flow in the vicinity of the diffuser, and DYNTOX to incorporate river and treatment plant conditions to develop the statistical analysis of the magnitude, duration, and frequency of constituent conditions in the plume downstream of the diffuser. The modeling system is described in the ADA performed by

the District and elsewhere in the record. A review of the appropriateness of the District's modeling system has been provided to the Regional Board by its contractor[103].

The District's 2000 NPDES permit (Order No. 5-00-188) required the District to develop a work plan to investigate the dilution and mixing provided by the diffuser in the Sacramento River. (Order No. 5-00-188, at p. 18.) Accordingly, the District developed a work plan in 2001 to address the Regional Board's concerns.

An Independent Technical Review Committee (ITRC) was then convened in 2001 to evaluate the District's work plan and modeling approach. The ITRC process was intended to provide assurances to the regulatory agencies, master-planning process stakeholders, and other interested parties that the selected data handling and modeling methods met or exceeded standard scientific practices in the environmental engineering industry and were appropriate for their intended use. The ITRC, a three member independent panel comprised of national modeling experts, found that the District's modeling effort: 1) appropriately framed the water quality issues; 2) employed appropriate and extensive data handling and modeling procedures; and 3) produced appropriate (but conservative) modeling output for evaluating receiving water quality in 2020, thereby providing key information in support of the chosen level of wastewater treatment. Two of the expert panelists noted that the conservative nature of the modeling performed means that impacts would likely be less than those estimated from the modeling results. Additionally, the ITRC panel members noted the distance considered by the model, extending 700 feet downstream of the SRWTP diffuser, covers a very small area when considering the integrity of the Sacramento River and Delta as a whole.

PROSIM is a Bureau of Reclamation model developed to simulate monthly flow and temperature in the Sacramento River given the operations of the State Water Project and Central Valley Project dams, diversions, etc., based on a 70-year period of record for meteorological conditions.

The LDM simulates the reversal events in the Sacramento River. The model compliments the Fischer Delta Model refining the transport calculations allowing analysis of the plume under reversal river conditions. In a study of the dispersion coefficient utilized in the LDM,[104] it was found that transport by the average river flow (i.e., advective transport) dominates dispersion at the time and space scales of river reversals.

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[103] Memorandum, Review of the Sacramento Regional County Sanitation District's Dynamic Modeling Study for the Sacramento Regional Wastewater Treatment Plant, to James D. Marshall, Regional Board, from John Hamrick, Jon Butcher Tetra Tech. (June 30, 2008).

[104] Flow Science Incorporated (2006), Results of Longitudinal Dispersion Model of Worst Case Reverse Flow Events. Prepared for FRWA and SRCSD. Aug. 2006.

The FDM was initially assessed in the early 1990's as to the calibration, validation, and uncertainty of the calculated plume[105]. The assessment compared the FDM simulated plume to dye studies performed in August 1991 and January 1992, to which there was a favorable comparison. More recent assessments addressed the model sensitivity to inflow velocity profiles, dilution level used to define the edge of the plume, and difference between simple arithmetic and flux weighted averaging of results.

In the last several years, the District has performed additional, extensive dye studies to build calibration/validation data sets for the modeling system[106,107,108]. Each of the additional studies has included bathymetric surveys to better define the river geometry. Based on the results of these 3 dye studies, the District modified the diffuser by closing the 25 eastern most ports of the 99 port diffuser. In addition, all remaining 8-inch reducers were removed, so that all of the remaining 74 open ports are currently 10 inches in diameter. Most recently, a final field dye study[109] was conducted in November 2007 to study the effect of closing the diffuser ports on the distribution and dilution of the effluent plume in the Sacramento River. The FLOWMOD results accurately predict the location and extent of the plume downstream of the diffuser. The envelope of measured dye concentrations (and inferred effluent dilution) downstream of the diffuser is also well predicted. Based on the diffuser modifications and subsequent November 2007 dye study, it is concluded that the model is accurate (conservative in the near field—less than 100 feet; very accurate from 100 to 700 feet) and validated by the field data collected in this study.

Additionally, Tetra Tech provided an independent technical review of all aspects of the District's dynamic model[110]. The conclusion of that review is that the dynamic modeling study was conducted in a sound and scientifically defensible manner. The review noted the unprecedented extent of the field dye investigations to support the FLOWMOD dilution model. Further, Tetra Tech concluded that the District's dynamic modeling tool is capable of providing a probabilistic

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[105] Flow Science Incorporated (2006), Model Sensitivity Analysis for FLOWMOD Simulations of the SRCSD Effluent Discharge into the Sacramento River at Freeport, CA, prepared for SRCSD. Sept. 2006.

[106] Flow Science Incorporated (2006), Model Verification Results for FLOWMOD Simulation of SRCSD Effluent Discharge to the Sacramento River at Freeport, October 2005 Field Study.

[107] Flow Science Incorporated (2006), Model Verification Results for FLOWMOD Simulation of SRCSD Effluent Discharge to the Sacramento River at Freeport, June 2006 Field Study.

[108] Flow Science Incorporated (2006), Model Verification Results for FLOWMOD Simulation of SRCSD Effluent Discharge to the Sacramento River at Freeport, November 2006 Field Study.

[109] Flow Science Incorporated (2008), *Model verification results for FLOWMOD simulations of SRCSD effluent discharge to the Sacramento River at Freeport, November 2007 Field Study*. Prepared for Sacramento Regional County Sanitation District. June 9, 2008.

[110] Memorandum, Review of the Sacramento Regional County Sanitation District's Dynamic Modeling Study for the Sacramento Regional Wastewater Treatment Plant to James D. Marshall, Regional Board, from John Hamrick, Jon Butcher, Tetra Tech (June 30, 2008).

representation of receiving water quality conditions including frequency and duration of periods when standards are exceeded.

After considerable evaluation and discussion, Regional Board staff accepted the District's dynamic modeling tool as being appropriate for use in the NPDES permit renewal process.[111] Specifically, Regional Board staff stated:

> Based on the results of the extensive reviews and validation studies that have been performed, Regional Water Board staff will proceed to use the District's modeling tools for the NPDES permit renewal process. Specifically, the tools are judged to be suitable for use in the dynamic near field modeling of the District's discharge and the derivation of water quality based effluent limits (WQBELs). Use of the dynamic modeling approach for derivation of WQBELs is specifically authorized in the State Implementation Plan (SIP) and in the USEPA Technical Support Document (TSD) for Water Quality-based Toxics Control.

As the District's model was developed in a sound and scientifically defensible manner, the results of the models indicating concentrations and compliance with the magnitude, duration, and frequency of the criteria and objectives are accurate and defensible. In guidance, U.S. EPA states[112], "[D]ynamic models make best use of the specified magnitude, duration, and frequency of water quality criteria and thereby provide a more accurate calculation of discharge impacts on ambient water quality." Additionally, U.S. EPA states[112], "[I]f adequate receiving water flow and effluent concentration data are available to estimate frequency distributions, EPA recommends that one of the dynamic wasteload allocation modeling techniques be used to derive wasteload allocations [i.e. effluent limits] which will more exactly maintain water quality standards." Where available, a dynamic model is preferable to a steady state model as the dynamic approach is a more robust and accurate representation of the conditions in the receiving water. For all of the reasons described above, the denial of the model for use in the determination of any effluent limits in the Tentative Permit is unreasonable and not in good faith, considering the extensive requirements, review, and comments made over the past ten years to validate the model and to respond to questions raised by Regional Board staff.

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[111] Letter from Kenneth D. Landau to Mary K. Snyder, Acceptance of Sacramento Regional County Sanitation District's Dynamic Mathematical Model for use in NPDES Permit Renewal for the Sacramento Regional Wastewater Treatment Plant (April 2, 2009).

[112] Memorandum from Martha G. Prothro to Water Management Division Directors, Regions I-X, re Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria, Attachment #3, Guidance Document on Dynamic modeling and Translators (August 1993) (Prothro Guidance Document).

C. Denial of an Acute Mixing Zone Here Would Be Inappropriate and Inequitable

The SIP is used to establish mixing zones throughout the Central Valley and the State of California for discharges to inland surface waters, enclosed bays and estuaries. In compliance with the SIP and other applicable regulatory requirements and provisions (i.e., Basin Plan and TSD), the District has employed extensive efforts to model its discharge and evaluate the risks it poses in the near-field. (See section V.B, ante.) The District's dynamic model results show that there is no unacceptable risk to aquatic life within the proposed mixing zone[113] [114]. Furthermore, the proposed acute mixing zone for the District's discharge has been established in a manner that is consistent with other acute mixing zones granted by the Regional Board in other NPDES permits. The denial of an acute mixing zone here, without proper cause, would be inconsistent with the Regional Board's practice of granting acute mixing zones to other POTWs. Examples of Region 5 discharges granted a dilution credit and an acute mixing zone are shown in Table V.1 above.

D. Use of Region VIII Guidance

In determining the appropriateness of granting an acute mixing zone, the Tentative Permit references a 1995 policy for one of the ten U.S. EPA regions, U.S. EPA Region VIII. (Tentative Permit at p. F-35.) The Tentative Permit then uses its interpretation of that guidance to deny approval of an acute mixing zone. (Tentative Permit at p. F-35.) Specifically, the Tentative Permit refers to the Region VIII document with respect to the applicability of mixing zones to acute aquatic life criteria. (*Ibid*.) However, the Tentative Permit fails to completely consider the U.S. EPA Region VIII guidance, which contains provisions for approving acute mixing zones for discharge situations similar to that which exists for the SRWTP discharge. (U.S. EPA Region VIII Guidance at Appendix D.) While the District's proposed mixing zone meets the criteria proposed by Region VIII, the Regional Board should (and must) rely on the mixing zone policies established under the SIP, which was adopted by the State Water in 2000 (and amended in 2005) rather than on guidance for another U.S. EPA region for the reasons stated below. The SIP is the state's governing regulatory requirement for establishing mixing zones for priority pollutants in California, and the SIP has been approved by U.S. EPA.

First, it should be noted that California is in U.S. EPA Region IX—not Region VIII. U.S. EPA Region VIII covers the states of Colorado, Utah, Wyoming, North Dakota, South Dakota, and Montana. Thus, the U.S. EPA Region VIII guidance referenced in the Tentative Permit does not apply to California or the District's discharge. Also, the U.S. EPA Region VIII *Mixing Zones*

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[113] Technical Memorandum, "Mixing Zones and the Prevention of Acutely Toxic Conditions, to Robert Seyfried and Vyomini Pandya SRCSD (July 13, 2009).

[114] SRCSD, Antidegradation Analysis for Proposed Discharge Modification for the Sacramento Regional Wastewater Treatment Plant, prepared by Larry Walker Associates. May 20, 2009.

and Dilution Policy is a 1995 document that was developed to upgrade methods for deriving water quality-based permit limits, improve the technical defensibility of NPDES permits, and reduce risks associated with mixing zone and dilution practices in those states within its jurisdiction. The Region VIII guidance document was generated to stop the 1990's practice in that region of using a "simplified mass balance approach that effectively provides the entire critical low flow as a dilution allowance in calculating the permit limit, regardless of the rate of mixing." (U.S. EPA Region VIII Mixing Zones and Dilution Policy at p. 1.) Clearly, this is not the situation or the proposal regarding the mixing zone for discharges from the SRWTP. The guidance states that consideration of how quickly a discharge actually mixes is important in the mixing zone and dilution determination. As noted previously, the SRWTP diffuser causes "rapid mixing of effluent into the receiving water within a short distance of the discharge."[115] In addition, the District has conducted a thorough effort to model the discharge and to conduct field studies documenting dilution to evaluate the risks in the near field and, as described in the District's Anti-degradation Analysis[116], there is no unacceptable risk to aquatic life. The edge of the acute mixing zone proposed by the District is 60 feet downstream from the diffuser, which is consistent with the Region VIII guidance of not exceeding 100 feet. The purpose of the Region VIII guidance was to implement a mixing zone approach that placed controls on the size and quality of effluent plumes. Further, the U.S. EPA Region VIII guidance document acknowledges that the document serves as guidance and that States and Tribes should develop their own methods and criteria for setting up acute and chronic mixing zones. Through the SIP and Basin Plans, California has developed methods and criteria for setting acute, chronic, and human health mixing zones. Thus, the U.S. EPA Region VIII guidance is not applicable jurisdictionally or by analogy.[117]

E. The District's Proposed Mixing Zones Will Not Compromise or Adversely Affect Beneficial Uses

By definition a "mixing zone is a limited volume of receiving water that is allocated for mixing with a wastewater discharge where water quality criteria can be exceeded without causing adverse effects to the overall water body." Additionally, all applicable water quality objectives

[115] California Regional Water Quality Control Board, Central Valley Region. Order No. 5-00-188. NPDES No. CA0077682.

[116] Larry Walker Associates, 2009. Anti-Degradation Analysis for Proposed Discharge Modification to the Sacramento Regional Wastewater Treatment Plant. DRAFT. Prepared for Sacramento Regional County Sanitation District. May 2009.

[117] In contrast to the Region VIII guidance, a review of the mixing zone size requirements from around the country are listed in the Technical Memorandum: Mixing Zone Size Restrictions from Select States, from Mitchell Mysliwiec, Ph.D., Larry Walker Associates to Robert Seyfried, District (Oct. 8, 2010). Just as the U.S. EPA Region VIII guidance is not applicable jurisdictionally, the size restrictions of other states are not applicable to California. However, the document highlights the variety of mixing zone size requirements across the nation. Specifically, the U.S. EPA Region VIII guidance is not typical of requirements for most other states.

and criteria apply at the edges of mixing zones. (SIP at p. 13.) Organisms passing through the acute mixing zone will not experience acute toxicity. The area of the requested chronic mixing zone is small in comparison to the size of the Sacramento River, and therefore would have little effect on the integrity of the water body as a whole. Based on the above, and that the numeric and narrative objectives apply at the edge of mixing zones, the District's proposed mixing zones will not adversely affect beneficial uses. In fact, the Tentative Permit stipulates to this for proposed chronic and human health mixing zones. (Tentative Permit at pp. F-37 - F-39.)

F. Alternatives

The State Board provides the measure for granting mixing zones in Order WQO 2004-0013:

> While granting a mixing zone is discretionary, in reaching our conclusion we consider that the Regional Board did not fully consider information in the record, the high cost to meet the effluent limitations without allowing this dilution credit, and the lack of evidence of any harm associated with such a mixing zone. (State Board Order WQO 2004-0013, at p. 12.)

The District has performed extensive modeling to determine the extent, and dilution provided by the diffuser for the SRWTP discharge. The modeling of the receiving water and mixing zones has been peer reviewed and approved by the Regional Board for use in permit development, including WQBEL calculation. (Section V.B, ante.) However, the Tentative Permit states that the acute mixing zone is either not needed or not acceptable. (Tentative Permit at p. F-37.) In chemical-specific arguments, the Tentative Permit states the acute mixing zone is not appropriate for ammonia, not needed for copper, not needed for cyanide, and not allowable for chlorpyrofos. (*Id*. at pp. F-39 - F-41.) Additionally, no chronic mixing zone is allowed for ammonia. (*Id*. at p. F-39.)

The State Board requires the consideration of the information in the record, the cost of treatment without allowing the dilution credit, and evidence of harm associated with the mixing zone. The District has supplied information demonstrating the proposed acute mixing zone is protective of aquatic life. The costs of treatment required due to denial of the mixing zones is not discussed or considered in the Tentative Permit as required. Additionally, the Tentative Permit discusses the Draft Ammonia Criteria for freshwater mussels. (Tentative Permit at p. F-55.) As discussed above in section II, without allowance for an acute mixing zone, the effluent limitation for ammonia to meet the Draft Ammonia Criteria for freshwater mussels would be lower, and possibly lower than technically feasible, than the limits currently in the Tentative Permit and may require additional unconsidered treatment requirements. With acute and chronic mixing zones, effluent limits based on the Draft Ammonia Criteria would be technically feasible. For both copper and cyanide, the Tentative Permit limitations are set to current effluent levels; if effluent concentrations change (e.g., through water conservation), additional treatment may be necessary to meet arbitrarily set performance limits—not limits necessary to protect beneficial uses. However, with the appropriate mixing zones, effluent limitations would be established

which protect the beneficial uses in the Sacramento River. Disallowing the mixing zones for chlorpyrifos because it is 303(d)-listed is inconsistent with prior State Board Orders. "In Order No. WQO 2001-06 (Tosco), we addressed this same issue. There, we stated that 'the listing itself is only suggestive; it is not determinative.' " (*In the Matter of the Petition of Yuba City*, State Board Order WQO 2004-0013, at p. 14.) Also, "[W]e stated that in developing effluent limitations, regional boards must review available ambient data and base their determinations on those data." (*Id.* at p. 14.) The Tentative Permit denies mixing zones for chlorpyrifos while stating, "[A]lthough there appears to be assimilative capacity in the vicinity of the discharge, the Sacramento-San Joaquin Delta is impaired for chlorpyrifos." (Tentative Permit at pp. F-40 - F-41.) The Tentative Permit does not use its own assessment of available assimilative capacity in the denial of a mixing zone for chlorpyrifos. The acute and chronic mixing zones are protective of beneficial use, and are appropriate for ammonia, copper, cyanide, and chlorpyrifos.

With respect to the Alternative Permit Options, the record demonstrates the proposed acute, chronic, and human health mixing zones provide protection of the respective beneficial uses in the Sacramento River. Disallowing the proposed mixing zones does not provide additional benefit to the receiving waters but causes a substantial cost to be incurred by District ratepayers. As the available information demonstrates, the mixing zones do not compromise the beneficial uses in the Sacramento River and the allowance of mixing zones avoids significant costs to the ratepayers. Thus, the Regional Board should adopt Dilution Alternative 3 in Table 1 of the Tentative Permit Options, which grants acute, chronic, and human health mixing zones for the SRWTP discharge.

Further, the acute, chronic and harmonic mean mixing zones should be used with the respective criteria and objectives to calculate the WQBELs using the District's approved dynamic modeling tool. The dynamic model, approved by the Regional Board, provides a more accurate means to calculate WQBELs necessary to provide protection to beneficial uses. "If adequate receiving water flow and effluent concentration data are available to estimate frequency distributions, one of the dynamic modeling techniques should be used to develop more cost-effective treatment requirements." (TSD at p. 83.) Where the WQBELs far exceed the current SRWTP performance, the Regional Board may elect to adopt reasonable performance-based limits. However, the Regional Board should find the acute, chronic, and human health mixing zones appropriate for the SRWTP discharge, calculate WQBELs accordingly, and then as necessary determine if performance-based effluent limitations are appropriate. Where the performance-based effluent limitations are deemed necessary, the Regional Board is required to set forth findings that ". . . clearly explain the basis for establishing the more stringent effluent limitations." (State Board Order No. WQO 2004-0013, at p. 16.)

VI. EFFLUENT AND RECEIVING WATER LIMITS

The Tentative Permit proposes to include a number of new WQBELs that would apply to discharges from the SRWTP. The District has a number of concerns with many of the proposed WQBELs. In many cases, the proposed final limits are in fact not WQBELs—but final limits: based on inappropriate or non-existing water quality criteria or objectives; calculated without the consideration of dilution; and/or based on performance that fail to provide any margin of safety even though significant dilution and assimilative capacity is available.

A. Effluent Limits

The Fact Sheet cites the following general reasons for not using actually calculated WQBELs:

- An acute mixing zone is not needed or acceptable to ensure protection of the beneficial uses of the receiving water (ammonia, copper, chlorpyrifos, cyanide)
- Dilution credit denied because technology exists that would allow the limit to be met without dilution (total coliform, pH, nitrate)
- WQBELs calculated using a dynamic model are not necessary (ammonia, copper, cyanide, chlorpyrifos)
- WQBELs based on human health criteria and harmonic mean dilution would allocate an unnecessarily large portion of the receiving water's assimilative capacity (manganese, carbon tetrachloride, chlorodibromomethane, bromodichloromethane)
- While assimilative capacity exists, the discharger can meet the effluent limit without dilution

In addition, performance-based effluent limits are established for electrical conductivity (EC) and mercury that provide no margin of safety for water conservation or growth.

As discussed for the individual constituents identified below, the approach taken in the Tentative Permit results in unnecessarily low effluent limits that will present compliance issues for the District even though such limits are not necessary to provide reasonable protection of beneficial uses. As a preliminary matter, our overarching concerns with respect to the applicability of mixing zones, dynamic modeling, and the basis for performance-based effluent limits are presented here.

As discussed in section V. ante, an acute mixing zone is allowable under the SIP, the Basin Plan, and U.S. EPA's TSD. The District has provided ample documentation to show that the granting of an acute mixing zone would not adversely affect aquatic life or other beneficial uses.

The SIP allows the use of a dynamic model to calculate effluent limits based on both acute and chronic criteria when the dynamic model is approved by the Regional Board. (SIP at p. 13.) U.S. EPA has stated that, "[d]ynamic models make best use of the specified magnitude, duration, and frequency of water quality criteria and thereby provide a more accurate calculation of discharge impacts on ambient water quality. In contrast, steady-state modeling is based on various simplifying assumptions which makes it less complex and less accurate than dynamic modeling." (Prothro Guidance Document at Attachment 3, p. 1.) Further, "EPA recommends that one of the dynamic wastewater allocation modeling techniques be used to derive wasteload allocations which will more exactly maintain water quality standards." (*Id*. at p. 2.) As indicated previously, the District has worked exhaustively with Regional Board staff to provide adequate documentation that the District's dynamic model is valid and appropriate for approval. (See section V, ante.) As a result of these efforts, the model was approved for use in developing effluent limits for the District's permit.

> Regional Water Board staff will proceed to use the District's modeling tools for the NPDES permit renewal process. Specifically, the tools are judged to be suitable for use in the dynamic near field modeling of the District's discharge and the derivation of water quality based effluent limits (WQBELs). Use of the dynamic modeling approach for derivation of WQBELs is specifically authorized in the State Implementation Plan (SIP) and in the USEPA Technical Support Document (TSD) for Water Quality-based Toxics Control.[118]

Thus, WQBELs calculated using the District's dynamic modeling are both appropriate and consistent with the SIP.

The District acknowledges that many of the WQBELs based on human health criteria and, therefore, calculated based on the harmonic mean dilution, are orders of magnitude higher than current plant performance. Accordingly, the District does not object to more stringent limits than the calculated WQBELs. In those instances, however, performance-based limitations should include an appropriate margin of safety. Prior to release of the Tentative Permit, the District provided information to the Regional Board staff to facilitate these determinations. (Memorandum from Betsy Elzufon to Bob Seyfried et al., Approach to Water Quality-Based Effluent Limits Based on Performance (Aug. 2010).) However, the Tentative Permit proposes performance-based effluent limits that are unnecessarily stringent and may present unnecessary and inappropriate compliance problems for the District. In lieu of the performance-based limits proposed in the Tentative Permit, the District proposes alternative performance-based effluent limits (PBELs) that utilize little assimilative capacity, have no additional impact on beneficial

[118] Letter from Kenneth Landau, Executive Officer, Central Valley Regional Water Quality Control Board to Mary Snyder (April 2009).

uses, and provide for an appropriate margin of safety that would avoid compliance problems for the District that are unrelated to the protection of beneficial uses.

The District's specific concerns with individual final effluent limitations, and with the Tentative Permit's approach for determining these limits, is discussed further here.

1. BOD and TSS

The Tentative Permit proposes WQBELs for BOD and TSS based on the requirement to implement tertiary treatment. (Tentative Permit at p. F-17.) As discussed extensively in section I, ante, the District objects to the adoption of effluents limits based on a tertiary treatment requirement. For all the reasons previously provided, such limits are not appropriately applied to the discharges from the SRWTP. We note that despite the SRWTP being a secondary treatment facility, it is a high performing facility with overall average BOD and TSS effluent concentrations below the average tertiary monthly effluent limits (AMEL) of 10 mg/L for BOD and TSS (BOD average concentration of 7.59 mg/L and TSS average concentration of 6.68 mg/L). The maximum average monthly BOD concentration based on data collected between June 2005 and July 2008 is 11 mg/L and the maximum average monthly TSS concentration is 10.5 mg/L. While the SRWTP cannot consistently comply with the tertiary standards, the quality of the effluent from the current treatment system is high.

2. pH

The Tentative Permit proposes an instantaneous minimum pH limit of 6.5 and an instantaneous maximum pH limit of 8.5. This proposal is based on application of the Basin Plan water quality objective for surface water with no consideration for dilution. However, as noted in the Tentative Permit, dilution for chronic aquatic life criteria is available for the SRWTP discharge. The pH water quality objectives are designed to protect aquatic life from chronic impacts. (See Quality Criteria for Water, U.S. EPA (July 1976) (The Red Book) at pp. 178-180 [concern with pH to freshwater fish between 5 and 9 is a gradual deterioration—not lethality].) Considering the amount of dilution available and with the establishment of a chronic mixing zone, it is not necessary for the effluent to meet the surface water quality objective at the end-of-pipe. Thus, the District requests that the effluent limitation for pH be calculated with appropriate consideration for actual dilution that occurs in the Sacramento River. At the very least, the Regional Board should adopt a minimum pH effluent limit of 6.0, which is the limit contained in the District's current permit, which would result in compliance with the Basin Plan objective for pH.

The minimum effluent pH based on data collected between June 2005 and July 2008 was 6.2. River pH levels were evaluated using the dynamic model and receiving water pH data collected between January 1998 and July 2008 and effluent data from June 2005 to July 2008. As shown in Table VI.1 below, the pH of the receiving water in the near-field plume is rarely below 6.5. Beyond 100 feet, which is less than the chronic mixing zone of 350 feet, the pH is never

below 6.5. Moreover, at 100 feet, the plume is in the bottom portion of the river with a clear zone of passage on either side and over the top of the plume.

Table VI.1.

181 mgd (2008 Constituent Concentrations)	Criteria Value	pH					
		30 ft	60 ft	100 ft	175 ft	350 ft	700 ft
		(Standard Units)					
Mean	--	6.91	7.03	7.14	7.25	7.37	7.42
Median	--	6.86	7.00	7.12	7.23	7.37	7.42
95 %-ile	--	7.59	7.59	7.60	7.61	7.68	7.71
99.91 %-ile	--	8.18	8.18	8.18	8.18	8.18	8.18
5 %-ile	--	6.58	6.70	6.83	6.95	7.09	7.14
Percent of Time Criteria Exceeded (%)							
U.S. EPA – Human Health (Lower Bound)	5	0.00	0.00	0.00	0.00	0.00	0.00
U.S. EPA – Human Health (Upper Bound)	9	0.00	0.00	0.00	0.00	0.00	0.00
Basin Plan (Lower Bound)	6.5	1.42	0.25	0.03	0.00	0.00	0.00
Basin Plan (Upper Bound)	8.5	0.00	0.00	0.00	0.00	0.00	0.00

Requiring the SRWTP to meet a minimum pH of 6.5 would result in additional chemicals being added to the effluent, which would increase the salts (i.e., Total Dissolved Solids (TDS)) levels in the effluent. The minimum pH in the effluent was below 6.5 approximately 20% of the time between June 2005 and July 2008 and ranged from 6.1-6.4. Approximately 10 mg/L of TDS would be added to the effluent for each 0.1 increase in pH. The additional salt load to the river provides no additional environmental benefit with respect to receiving water pH or protection of aquatic life uses, and is not appropriate. The additional TDS load may also have an impact on the SRWTP's ability to comply with the EC limit. In meantime, ample dilution is available for the pH in the receiving water and beneficial uses are not adversely affected. Thus, the Tentative Permit should be amended to include an effluent limit for pH that sets the minimum limit at 6.0. (Note that this would have no adverse effect on ammonia toxicity.) With this modification, the Draft TSO would not include pH. With respect to the maximum value, the District requests that the effluent limit for pH be set at 8 for the reasons specified in section IV.A.4, post.

3. Total Coliform and Turbidity

The Tentative Permit proposes final effluent limits for total coliform based on Title 22 requirements that typically apply to unrestricted use of recycled water. (Cal. Code Regs., tit. 22, § 60304(a).) As discussed earlier in section I, ante, it is inappropriate for the Regional Board to adopt total coliform limits equal to Title 22 disinfection requirements for unrestricted reuse for this discharge. As described previously, the District supports the alternative effluent limit for total coliform of 23 MPN/100 mL as a 7-day median.

4. Ammonia

The Tentative Permit proposes final effluent limits for ammonia without consideration of dilution, citing concerns over potential impacts to aquatic life in the Delta. As discussed previously, this is inappropriate. (See section II, ante.)

As shown in Attachment H of the Tentative Permit, Regional Board staff calculated WQBELs using the dynamic model for the scenario where an acute mixing zone is granted and the scenario where only a chronic mixing zone is granted. (Tentative Permit at p. H-1.) The calculated WQBELs are compared to the maximum observed effluent concentrations in Table VI.2 below.

Table VI.2. Ammonia-N Effluent Limits

mg/L as N	Average Monthly	Maximum Daily
Acute and Chronic Mixing Zones	41	51
Chronic Mixing Zone Only	11	13
Maximum Observed Effluent Concentration		45

Even if the Regional Board grants *acute* dilution credits for ammonia toxicity, thereby establishing WQBELs for toxicity with which the SRWTP's existing discharge complies, the District is committed to reducing effluent ammonia levels to ensure that DO levels downstream of its discharge meet Basin Plan objectives. (Section II.B, ante.) The District has extensively modeled DO downstream of the discharge to determine the location of the DO sag, and calculated the maximum level of oxygen demand (i.e., UOD) that can be present in the discharge and still ensure that DO does not go below the Basin Plan objective of 7.0 mg/L at the locations where the lowest DO levels occur in the Sacramento River (i.e., Isleton). (Memorandum from M. Mysliwiec, LWA, to Bob Seyfried, SRCSD, "Response to TetraTech Comments on the LDOPA" (Aug. 26, 2010).) Using estimated intra-daily DO variation, preliminary model results are used to derive AMEL and maximum daily effluent limit (MDEL) for UOD that would achieve the Basin Plan objective over critical conditions reflective of 70 years of observed hydrologic conditions. Those UOD limits were provided to Regional Board staff in an August 30, 2010, e-mail. (Table 5 Correction for May 2010 LDOPA_3_.pdf.) In the SRWTP

effluent, the UOD consists primarily of BOD and ammonia. Ammonia reduction efforts will be driven by ensuring that the UOD limit is always met. Therefore, the appropriate ammonia effluent limits should be based on WQBELs considering acute and chronic dilution and UOD limits to meet downstream DO levels. These effluent limits are the basis for the Dilution #3, Ammonia #2 Alternative as described in Table 3 of the Tentative Permit Options. However, we believe there are some errors in this table. The ammonia effluent limits of 37 mg/L as an AMEL and 47 as an MDEL are based on a permitted effluent flow of 218 mgd. The AMEL and MDEL that are applicable to 181 mgd with acute and chronic dilution are found in Attachment H of the Tentative Permit (i.e., 41 mg/L as an AMEL and 51 mg/L as an MDEL). (Tentative Permit at p. H-1.) In addition, it appears that the values from Table 5 may have been inserted incorrectly into Table 3. The correct values are:

Table VI.3.

Constituents		**Tentative Permit Dilution Ammonia #2**		**Dilution #3 Ammonia #2**	
		HH and Chronic UOD Req'ts		**HH, Chronic and Acute UOD Req'ts**	
		AMEL	**MDEL**	**AMEL**	**MDEL**
Ammonia (as N)	mg/L	11	13	41	51
UOD (dry season)	lbs/day	169,000	234,000	169,000	234,000
UOD (wet season)	lbs/day	275,000	438,000	275,000	438,000

While the District strongly believes that dilution credit for ammonia toxicity is warranted, if dilution is denied for ammonia, the effluent limits should be determined on a seasonal basis. In addition, it is requested that a maximum permitted pH of 8.0 be used to calculate the acute ammonia criteria. It is appropriate to use a maximum pH permitted value of 8.0 because the District's effluent typically ranges between 6.2 and 7.3. Since at least 2000, it has never exceeded 8.0. Further, any changes to the treatment processes are not anticipated to cause the effluent to exceed 8.0. If an end-of-pipe limit based on the U.S. EPA criteria applies, the District would also request that the effluent pH and temperature be used to calculate the chronic criteria consistent with applying this effluent limit as an end-of-pipe limit (i.e., no dilution). The resulting effluent limits using the approach requested would be an AMEL of 3.0 mg/L and an MDEL of 3.9 mg/L for March 1-October 31, and an AMEL of 3.6 mg/L and MDEL of 4.7 mg/L for November 1-February 29.

5. Chlorpyrifos

The Tentative Permit proposes final effluent limits for chlorpyrifos based on no consideration of dilution because the Delta is listed as impaired for chlorpyrifos on the state's 303(d) list. This denial of dilution is proposed even though the Tentative Permit indicates that there appears to be assimilative capacity in the vicinity of the discharge. (Tentative Permit at p. F-40.) The

proposed denial of dilution credits based on listing of impairment alone is not sufficient evidence to deny dilution. The State Board has consistently held that "the listing itself is only suggestive; it is not determinative[,]" and findings of denial must be directly linked to ambient monitoring data. (State Board Order No. WQO 2001-06 (Tosco); State Board Order No. WQO 2004-0013 ["Pursuant to our instructions in Order No. WQO 2001-06, the Regional Board must revise its findings and link the denial of assimilative capacity to the ambient monitoring data."].) Based on State Board precedent, the Tentative Permit improperly denies dilution credits as it does not do so based on actual ambient data, and because assimilative capacity exists within the vicinity of the discharge.

As noted previously, the acute and chronic mixing zones requested by the District meet all state requirements for mixing zones and are protective of beneficial uses. Further, effluent limits calculated using the District's dynamic model are more accurate than those using a steady state model and, therefore, are more representative, and protective of water quality.

As shown in Attachment H and in Table F-13, the Tentative Permit identifies WQBELs using the dynamic model for the scenario where an acute mixing zone is granted and for the scenario where only a chronic mixing zone is granted. (Tentative Permit at pp. F-41, H-1.) The calculated WQBELs are compared to the maximum observed effluent concentrations below. The Tentative Permit also presents steady state effluent limits. However, as noted above, because dynamic modeling provides more accurate representation of water quality conditions, it is inappropriate to evaluate steady state effluent limits when dynamic modeling results are available. Although the Tentative Permit presents this information, it proposes final WQBELs based on no dilution credits. (Tentative Permit at pp. F-41, F-68.)

Table VI.4. Chlorpyrifos Effluent Limits

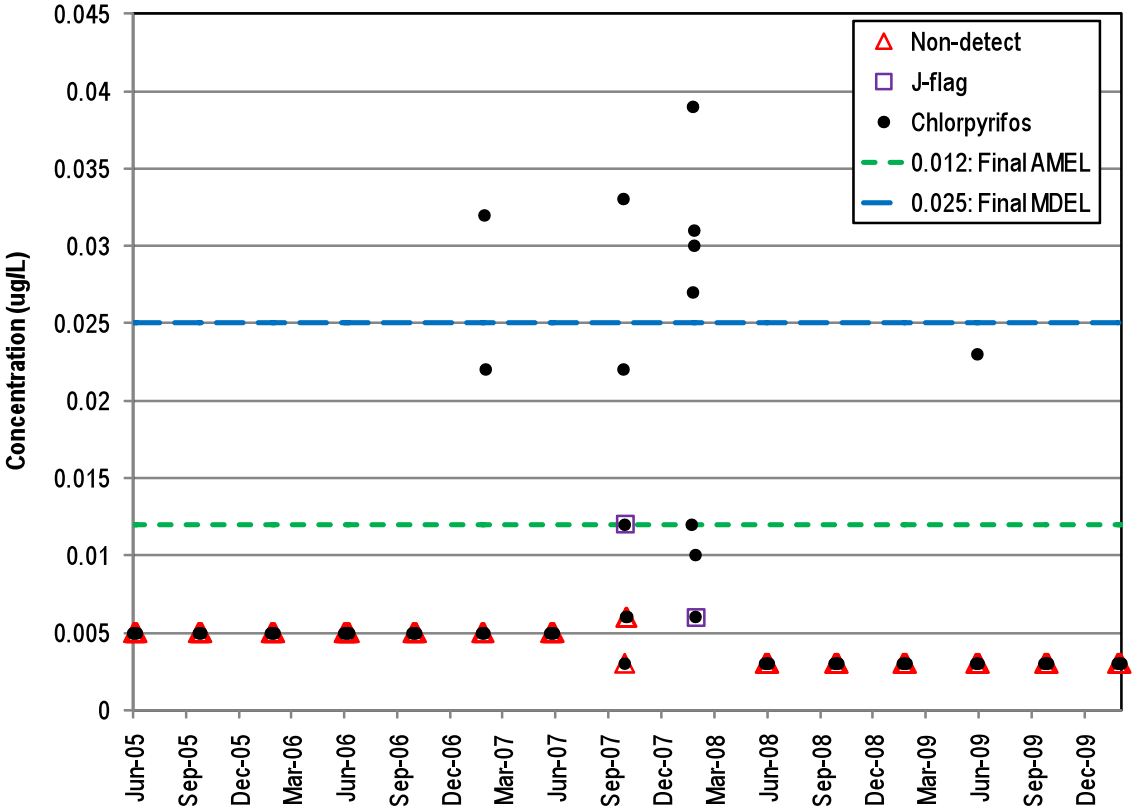
µg/L	Average Monthly	Maximum Daily
Acute and Chronic Mixing Zones	0.029	0.059
Chronic Mixing Zone Only	0.012	0.025
Maximum Observed Effluent Concentration		0.039

The detailed discussion of chlorpyrifos in the Fact Sheet is difficult to understand, but it appears to include a number of inaccurate statements. For example, for the water quality objective, the Fact Sheet references chlorpyrifos water quality objectives that apply to the Feather River, and the Sacramento River upstream of the I Street Bridge. In fact, there exist water quality objectives for chlorpyrifos that apply directly to the Delta. (See Basin Plan at p. III-6.01.) The adopted water quality objectives are 0.025 µg/L for the one-hour acute objective, and 0.015 µg/L for the four-day average chronic objective. With respect to the WQBEL discussion, as noted immediately above, dilution credits have been improperly denied based only on the fact that the Delta is listed as impaired for chlorpyrifos on the state's 303(d) list.

Another inaccuracy exists with respect to the discussion on plant performance and attainability. The Fact Sheet states that a "compliance time schedule for compliance with the chlorpyrifos effluent limitations is established in TSO No. R5-2010-XXXX . . . ." (Tentative Permit at p. F-69.) However, this is incorrect. An in-permit compliance schedule for chlorpyrifos is appropriate for any effluent limit that may be required, as reflected in the Tentative Permit which includes a compliance schedule. (Tentative Permit at p. 34.) The District would note, however, that the relevant water quality objective became final in 2008, and therefore an in-permit compliance schedule would appropriately extend only to 2018 rather than 2020.

Further, the Tentative Permit fails to acknowledge the District's aggressive pesticide pollution prevention and education efforts that are already underway. The District regularly provides the Regional Board with information regarding the District's organophosphate pesticide source reduction program in the pretreatment annual report. Source reduction efforts include contributions to the Sacramento Stormwater Quality Partnership's established Integrated Pesticide Management Program, which provides outreach and education on less toxic or alternative non-toxic pesticides; program advertising for various media, such as television, websites, printed materials, and utility bill inserts; and, promotion of the use of household hazardous waste facilities for disposing of unused chlorpyrifos through utility bill inserts. In addition, while the District cannot consistently comply with the proposed effluent limits, source reduction efforts appear to have been effective as shown in Figure VI.1 below. The number of detected values of chlorpyrifos has steadily decreased over time, with only one detected value since June of 2008.

Figure VI.1



Chlorpyrifos concentrations in SRWTP effluent (2005-2009)

Considering the availability of assimilative capacity as well as the District's aggressive and effective source control efforts, the Regional Board should grant an acute mixing zone for this constituent and should include final effluent limits of 0.029 µg/L as an AMEL and 0.059 µg/L as an MDEL.

6. Copper

The Tentative Permit states that assimilative capacity is available for copper, but does not include WQBELs based on assimilative capacity or dynamic modeling because dilution credits are deemed to be not needed. (Tentative Permit at p. F-39.) Instead, the Tentative Permit proposes effluent limits using a steady state effluent limit derivation approach. As noted above, effluent limits calculated using the dynamic models are more accurate and reflective of ambient water quality in the vicinity of the discharge. If adequate data and dynamic modeling tools and results are available, it is inappropriate to evaluate effluent limits using a steady state approach. The steady state and dynamic approaches are not equivalent, and the dynamic approach is acknowledged as being superior in all respects. (See section V.B., ante.)

As shown in Attachment H, Regional Board staff calculated WQBELs using the dynamic model for the scenario where an acute and chronic mixing zone are granted and for the scenario where only a chronic mixing zone is granted. (Tentative Permit at p. H-1.) The calculated WQBELs are compared to the maximum observed effluent concentrations in Table VI.5 below.

Table VI.5. Copper Effluent Limits

µg/L	Average Monthly	Maximum Daily
Acute and Chronic Mixing Zones	7.7	9.8
Chronic Mixing Zone Only	8.6	11
Maximum Observed Effluent Concentration		6.8

The effluent limits shown in the above table and calculated using the dynamic model based on acute and chronic mixing zones are protective of beneficial uses, attainable based on plant performance, and calculated using the most robust and accurate approach available. Conversely, WQBELs calculated without the dynamic model are less reliable and due to effluent variability may subject the District to mandatory minimum penalties or other unnecessary enforcement.

7. Cyanide

The Tentative Permit states that assimilative capacity is available for cyanide, and goes on to state that chronic dilution credit is allowed because the steady state limit cannot be met. Conversely, acute dilution is not allowed because the Tentative Permit declares that it is not needed. Further, the Tentative Permit finds that "granting of this dilution credit could allocate an unnecessarily large portion of the receiving water's assimilative capacity." (Tentative Permit at p. F-65.) Because of concerns associated with the WQBEL, which is calculated at 22 µg/L as the MDEL and 11 µg/L as the AMEL, the Tentative Permit proposes a final effluent limit of 11 µg/L as a MDEL.

In calculating WQBELs, the first step is not to first determine what is necessary for compliance but what is the appropriate WQBEL considering available dilution credits. When there are significant differences between the calculated WQBEL and plant performance, it may be appropriate for the Regional Board to make supportive findings to reserve some portion of the assimilative capacity. (See State Board Order WQO 2004-0013, at p. 13.) However, this process has not occurred for cyanide. In addition, significant modifications to the SRWTP have been proposed in the Tentative Permit and indirect impacts on the constituents that are not targeted by the new treatment processes have not been fully evaluated. Further, the impact of water conservation and growth on effluent levels of cyanide is also unknown.

As shown in Attachment H and in Table F-12 of the Tentative Permit, the proposed WQBELs are calculated using the dynamic model for the scenario where an acute and chronic mixing zone are granted and for the scenario where only a chronic mixing zone is granted. (Tentative Permit at pp. F-40, H-1.) The calculated WQBELs are compared to the maximum observed effluent concentrations in Table VI.6 below.

Table VI.6. Cyanide Effluent Limits

µg/L	Average Monthly	Maximum Daily
Acute and Chronic Mixing Zones	21	40
Chronic Mixing Zone Only	11	22
Maximum Observed Effluent Concentration		11

However, as noted above, the proposed effluent limit in the Tentative Permit is an MDEL of 11 µg/L. The Tentative Permit finds that the maximum effluent concentration (MEC) is 10 µg/L and, therefore, the SRWTP can comply with the MDEL. (Tentative Permit at p. F-66.) However, in Attachment H, the MEC is listed as 11 µg/L. In addition, the calculated statistical probability of compliance with a MDEL of 11 µg/L is 98.2%, which is less than the one-day in three-year threshold of 99.91%. Therefore, consistent compliance is not ensured.

Instead, WQBELs should be calculated with consideration of an acute and chronic mixing zone using the approved dynamic model. To the extent that the Regional Board determines that the calculated WQBELs are higher than necessary to ensure consistent compliance, the District recommends that final WQBELs then be set in a manner that is consistent with the approach proposed by the District in its memorandum *Approach to Water Quality-Based Effluent Limits Based on Performance*. (Betsy Elzufon, Larry Walker Associates, *Approach to Water Quality-Based Effluent Limits Based on Performance* (Aug. 2010) (Elzufon Effluent Limits Memo); see section A.11, post.) Using the District's proposed approach, the final effluent limits would be 15 µg/L and 9.7 µg/L as the MDEL and AMEL, respectively. (Elzufon Effluent Limits Memo at p. 4.)

8. Nitrate

The Tentative Permit proposes a final WQBEL for nitrate as an AMEL of 0.26 mg/L. The effluent limit is inappropriate as well as unattainable, as explained in section III, ante.

The Tentative Permit properly references established water quality criteria for the protection of the municipal and domestic water supply beneficial use. Specifically, the Tentative Permit references the 10 mg/L criterion for nitrate based on the primary maximum contaminant level (MCL). (Tentative Permit at p. F-71.) The Tentative Permit further states that the discharge has reasonable potential to cause or contribute to an in-stream excursion above the primary MCL for

nitrate. However, the Tentative Permit does not propose to adopt a WQBEL based on the primary MCL. As discussed above, it instead proposes to adopt a limit based on an unknown criterion for the protection of aquatic life. At most, the Regional Board would be justified in adopting a WQBEL for nitrate based on the primary MCL of 10 mg/L. As indicated in communications to the District, a proper AMEL with the consideration of dilution would result in an effluent limitation of 300 mg/L as N.[119] In the alternative, the Tentative Permit Options proposes an effluent limit of 127 mg/L as N. (Tentative Permit Options at p. 10.) In any case, the calculation of a WQBEL based on the primary MCL with some consideration for dilution is more appropriate than the final effluent limit proposed in the Tentative Permit.[120]

9. Mercury

The Tentative Permit proposes a final effluent limit for total mercury as an annual average mass limit of 2.2 pounds per year (lbs/yr), as a performance-based limit. (Tentative Permit at p. 14). The Fact Sheet for the Tentative Permit identifies the limit as 2.3 lbs/yr. (Tentative Permit at p. F-70.) Although the discrepancy is small, the ultimate limits in the Permit and the information in the Fact Sheet should match. More importantly, this final effluent limit does not provide any credit or consideration for the District's effective source control efforts that have been ongoing for several years. To recognize the District's efforts and to avoid penalizing the District for its efforts, the performance-based limit for mercury must be recalculated.

First, the Tentative Permit uses an inappropriate time period of effluent data to calculate the proposed limit. The Fact Sheet notes that the limit was calculated as the 99.9th percentile of the running annual total mercury loading based on effluent data from January 2005 through April 2010. (Tentative Permit at p. F-70.) The Fact Sheet claims that such calculation is consistent with the Delta Methylmercury TMDL. However, the District has several concerns with this approach. As a preliminary matter, the Delta Methylmercury TMDL is not yet approved by the State Board, the Office of Administrative Law, or U.S. EPA. Thus, it is not applicable at this time. More importantly, even if approved, the TMDL does not specify the appropriate time period for data to use in calculating performance-based mass loads. It states only that limits should be calculated as follows, "[t]he interim inorganic (total) mercury effluent mass limit is to be derived using current, representative data and shall not exceed the 99.9th percentile of

[119] Email from K. Harder to V. Pandya, R. Seyfried, J. Marshall, et al. Permit Options. June 30, 2010.

[120] For nitrate, the approach in the Elzufon Effluent Limits Memo would suggest that the appropriate nitrate limit should be 1.2 mg/L-N as an AMEL. (Elzufon Effluent Limits Memo at p. 4.) However, the approach there considers current performance of the existing SRWTP facilities. As discussed previously (section II, ante), it is more than likely that the SRWTP will need at least some modifications to ensure compliance with DO water quality objectives (i.e., partial nitrification), or full nitrification to comply with proposed ammonia limits. In either case, performance of the SRWTP with respect to nitrate will change and nitrate levels in the effluent will increase. Thus, the approach suggested in that memorandum is not applicable for setting WQBELs for nitrate that will apply to future effluent qualities.

12-month running effluent inorganic (total) mercury loads (lbs/year)." (Resolution No. R5-2010-0043, Attachment 1, at p. 4.) Based on the language in the TMDL, the District properly requested that the 99.9th percentile of the 12-month rolling monthly average be derived using effluent data from January 2004 through December 2009.[121] The District's proposed data period is current and representative, as it does not penalize the District for its significant proactive efforts to reduce mercury in the effluent. Using this data period, the performance-based limit would be 4.4 lbs/yr.

The District submits that its proposed calculated limit is more appropriate and more representative of performance for the SRWTP. Although the annual mercury load has remained below the proposed final limit since January 2006, compliance problems may arise in the future, especially if the slight upward trend beginning in April 2008 continues. Further, the Regional Board must recognize that the upward trend is most likely due, at least in part, to the additions of West Sacramento, Courtland, and Walnut Grove to the SRWTP. These communities have been added to the SRWTP in an effort to regionalize wastewater services, which is encouraged by the Regional Board. (See Resolution No. R5-2009-0028, In Support of Regionalization, Reclamation, Recycling and Conservation for Wastewater Treatment Plants.) In addition, basing the limit on the most recent time period would, in effect, penalize the District for the proactive source reduction it has accomplished since 2001.

As required by its 2000 NPDES permit (Order No. 5-00-188), the District implemented a source reduction program for mercury in 2001 that is ongoing and includes outreach to residents, dentists, and hospitals. The program has included a range of activities including participation in community events, mailings, audits of hospital and dental offices, and partnerships with Sacramento area household hazardous waste collection facilities to allow collection of bulk mercury, fluorescent lamps, and mercury thermometers. Currently, the District's Sewer Use Ordinance is being revised to allow prescriptive use of best management practices, including those intended to reduce mercury discharges to the SRWTP influent. As a result of its efforts, the District has seen a 60% decrease in effluent total mercury levels between 2001 and 2009, and a 50% decrease between 2004 and 2009, as shown in Figure VI.2 below.

The 2000 NPDES permit (Order No. 5-00-188) also allows the District to bank total mercury mass loadings under its limit of 5.1 lbs/yr for future offsets. Between 2000 and 2009, the annual mass loading has never exceeded the interim limit. As a result of its extensive source control efforts, the District has banked 21.5 lbs of mercury during this time period. However, the Tentative Permit proposes to eliminate and discard the District's banked credits because the District can supposedly meet the performance-based limit. This is inappropriate, and not good policy. As noted above, the District is concerned with being able to consistently comply with the

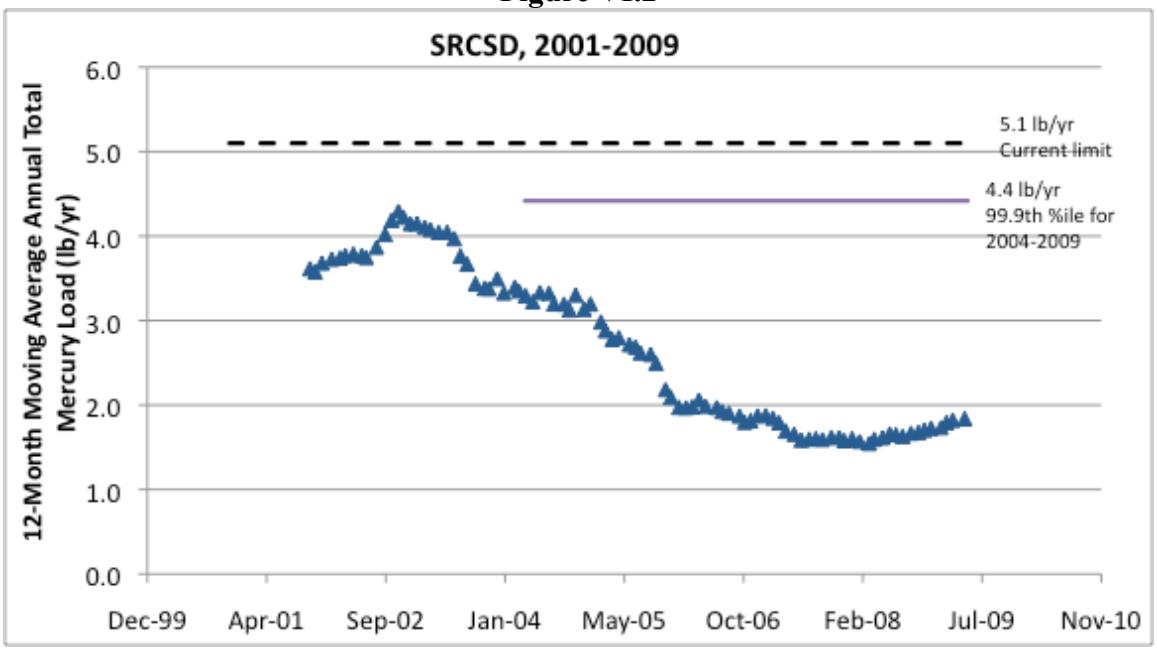
[121] R. Seyfreid, SRCSD. Memo to K. Harder and J. Marshall, CVRWQCB. Proposed SRCSD Interim Mercury Limits. August 12, 2010.

proposed limit. Further, being able to meet the performance-based limit is not a proper reason for eliminating banking credits that accrued over the current permit term. Thus, the Tentative Permit should be revised to maintain the District's ability to bank mercury credits, or at the very least, maintain the credits already banked.

Further, the District is also concerned that the SRWTP's impact on methylmercury loads is mischaracterized in the Fact Sheet. Under the discussion on RPA Results, it is stated that the 2000-2003 SRWTP methylmercury load to the Delta is comparable to the Cache Creek load contribution. (Tentative Permit at pp. F-69 - F-70.) This comparison is true only for a relatively short, relatively dry period. In reality, the long-term average methylmercury load from the Cache Creek Settling Basin is likely more than 10 times greater based on the 20-year average load estimate of total mercury and typical total:methyl ratios. The Tentative Permit also states that the District has contributed as much as 20 to 30% of the methylmercury loading to the river during drier periods when effluent mercury concentrations were higher (prior to source reduction efforts). (Tentative Permit at p. F-70.) However, these values are the maximum percentages from single readings. They are not representative of chronic conditions that are relevant to bioaccumulative effects. Average increases are less than 10%.

In sum, the District requests that current, representative data for the SRWTP include data from January 2004 through December 2009. This would result in a mercury mass limit of 4.4 lbs/yr based on a 12-month rolling monthly average, and would be consistent with statements made by Regional Board staff during development of the Delta Methylmercury TMDL to encourage early mercury reduction activities and to avoid penalizing proactive agencies in the establishment of limits and allocations. (See Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Methylmercury and Total Mercury in the Sacramento-San Joaquin Delta Estuary. Staff Report. (April 2010).)

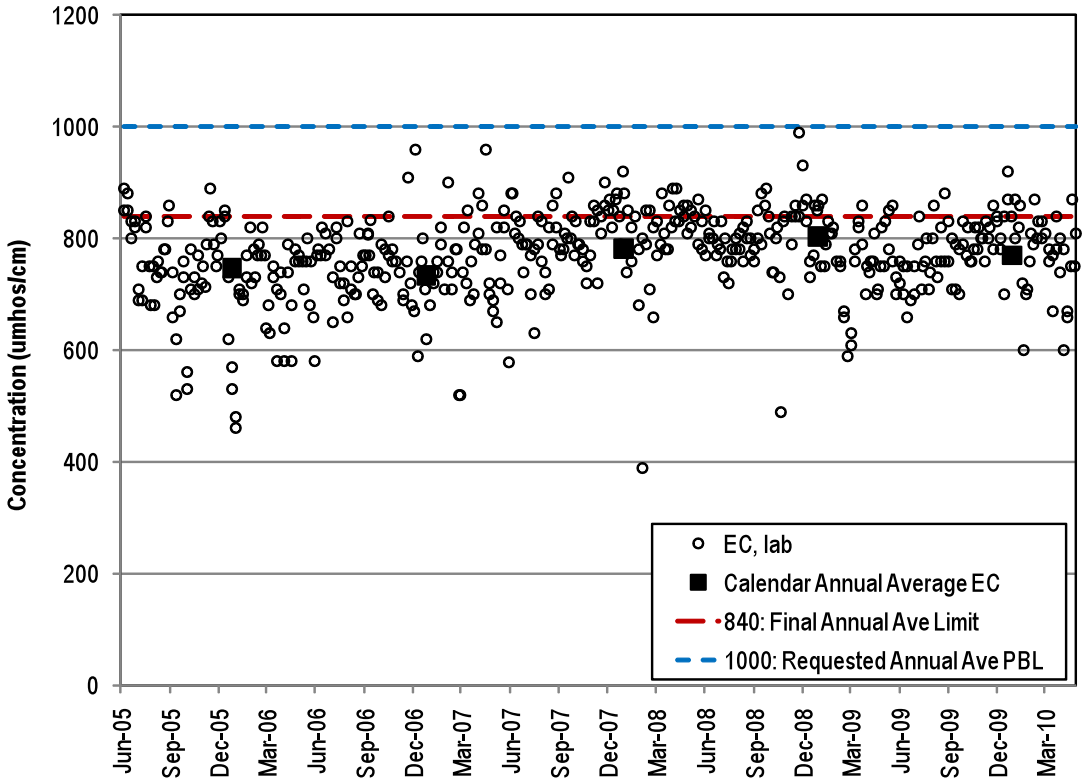
Figure VI.2



10. Electrical Conductivity (EC)

The Tentative Permit proposes a final effluent limit for EC as an annual average limit of 840 µmhos/cm. The Fact Sheet states that this performance-based limit is a 99.9th percentile of the running annual average effluent EC based on effluent data from June 2006 through April 2010. (Tentative Permit at p. F-50.) The limit proposed differs from the performance-based limit requested by the District on April 20, 2010. (See handout dated April 20, 2010, "Performance Based EC Limit for the SRWTP" and email from V. Pandya to Kathleen Harder dated July 27, 2010, re "Follow-up items from July 26 mtg".) Specifically, the District requested that the EC limit be calculated from the mean plus 3.3 times the standard deviation of the individual data points for the data set for June 2005 through July 2008, which results in an effluent limit of 1000 µmhos/cm as an annual average. The District noted in its request that the data set between June 2005 through July 2008 did not include a critical dry year, and does not account for future increases in EC due to water conservation efforts or increased use of groundwater by water purveyors or, as noted in the discussion on pH, changes in treatment plant operations. The 2006-2010 data set used by Regional Board staff does include a critical dry year, but the District's other concerns remain. To provide the margin of safety, the District requests that the effluent limit be based on the 99.9th percentile value (i.e., mean + 3.3 times the standard deviation) of the individual data points rather than the 99.9th percentile value of the running annual average.

Figure VI.3



Daily and Annual Average Effluent Electrical Conductivity

A review of the average annual EC calculated for calendar years between 2005 and 2009 indicates that EC has not exceeded the final proposed annual average limit, however there appears to be an upward trend. Therefore, the District may not be able to comply with the final effluent limit, especially as a result of water conservation, variations in water supply or changes in treatment plant operations (e.g., additional TDS added as a result of pH adjustment to meet a pH limit of 6.5). In addition, the Tentative Permit notes that the discharge does not have reasonable potential to cause or contribute to an in-stream excursion of water quality objectives for salinity. (Tentative Permit at p. F-50.) The relatively low salinity of the SRWTP discharge should be taken into account in establishing an effluent limit. The District requests that the effluent limit be 1000 µmhos/cm as an annual average as previously requested.

11. Constituents with Unnecessarily Low Performance-Based Effluent Limits

The Tentative Permit proposes a harmonic mean dilution credit of 56:1 for effluent limits based on human heath criteria. As a result, many of the calculated WQBELs are orders of magnitude higher than the maximum observed SRWTP effluent concentrations. The District agrees that

only a portion of the assimilative capacity is needed to guarantee compliance. However, the PBELs proposed in the Tentative Permit are much more stringent than necessary or reasonable and may result in unnecessary and inappropriate compliance issues. Table VI.7 below summarizes the District's concerns with PBELs associated with human health-based criteria proposed in the Tentative Permit. The statistical probability of compliance with the PBELs for manganese, chlorodibromomethane, bromodichloromethane, and bis(2-ethylhexyl) phthalate are all less than 99.91%, which is the compliance rate that corresponds to an exceedance no more than one day in three years. When establishing interim limits that are higher than water quality objectives, it may be reasonable to make the limit as restrictive as possible because some exceedance of a water quality objective may occur, resulting in adverse environmental impacts. This is not the case for PBELs, which are below the level necessary to protect beneficial uses. There are uncertainties with respect to future effluent concentrations because increases may result due to growth or water conservation. In addition, new treatment processes may result in significant reductions for certain constituents (e.g., ammonia), which may result in increases in other constituents. For example, it is the District's understanding that increases in trihalomethanes (THMs) have been observed by some dischargers installing nitrification and denitrification processes. As ammonia levels are reduced and pH levels are increased to meet the requirements of the Tentative Permit, increases in THM formation are likely.

Therefore, the District requests the PBELs be adopted as identified in the table below. The requested PBELs are those requested in the Elzufon Effluent Limits Memo mentioned above. Another approach would be to use the approach to determining interim limits described in the TSO (pp. 3-4) for 1,2-diphenylhydrazine and dibenzoanthracene. Those interim limits are calculated as 3.11 times the maximum observed effluent concentration. If this approach is acceptable for interim limits where a water quality criterion may be exceeded, then it should be acceptable for an effluent limit that results in ambient concentrations that are well below water quality criteria. PBELs based on this approach are also shown in the table below. Either approach presented here ensures reasonable protection of beneficial uses, preserve a significant portion of available assimilative capacity, and avoids unnecessary or inappropriate noncompliance for the SRWTP discharge.

Table VI.7.

Constituent	WQBEL	PBEL in Tentative Permit	Probability of Compliance[1]	PBEL requested by District	PBEL based on method in TSO
Manganese	2700 µg/L Annual Average	85 µg/L MDEL	93.6%	225 µg/L Annual Average	280
Chlorodibromo-methane	12 µg/L AMEL 15 µg/L MDEL	2.2 µg/L MDEL	99.87%	2.4 µg/L MDEL	3.0
Dichlorobromo-methane	27 µg/L AMEL 47 µg/L MDEL	3.4 µg/L MDEL	98.7%	6.8 µg/L MDEL	10.6
Bis(2-ethylhexyl)phthalate	94 µg/L AMEL 180 µg/L MDEL	13 µg/L MDEL	99.64%	26 µg/L MDEL	40.4
Cyanide	21 µg/L AMEL 40 µg/L MDEL	11 µg/L MDEL	98.2%	15 µg/L MDEL	31.1

[1] A Once-in-three-year noncompliance corresponds to a compliance rate of 99.91% for an MDEL and 97.2% for an AMEL.

12. N-nitrosodimethylamine (NDMA)

The Tentative Permit proposes a WQBEL for NDMA of 0.00069 µg/L as an AMEL and 0.0014 µg/L as an MDEL. (Tentative Permit at p. 13.) The TSO establishes an interim limit of 0.26 µg/L as an MDEL. (TSO at p. 5.) The District has evaluated its ability to comply with this interim limit and the probability of compliance with this limit is 99.89%, which is less than the one-day in three-year compliance rate of 99.91%. Therefore, and subject to section II.D, the District requests an interim limit of 0.30 µg/L to ensure compliance for the SRWTP discharge.

Further, as noted in the Fact Sheet, analytical method detection levels are greater than the CTR criteria. (Tentative Permit at p. F-61.) Therefore, assessing compliance with effluent limits is difficult. The District requests that the permit state in section VII, Compliance Determination, that compliance with this effluent limit be evaluated based on the Minimum Level in Appendix 4 of the SIP (i.e., 5 µg/L). It should also be noted that the analytical method specified for NDMA (U.S. EPA Method 521) is a drinking water method. Typically, drinking water methods are not appropriate to use in analyzing wastewater because of the more complex nature of the wastewater matrix. Therefore, the method detection level that is achievable for drinking water is not appropriate for wastewater monitoring.

13. 1,2-diphenylhydrazine

The Tentative Permit proposes a WQBEL for diphenylhydrazine of 0.04 µg/L as an AMEL and 0.08 µg/L as an MDEL. (Tentative Permit at p. 13.) The TSO establishes an interim limit of 8.7 µg/L as an MDEL. (TSO at p. 5.)

Reasonable potential for this constituent was triggered by two estimates (i.e., J-flagged values) with the rest of the data being below detection limits. (Tentative Permit at p. F-64.) As indicated in information submitted to the Regional Board previously, research with respect to analytical methods for this constituent reveals that analysis is based on a breakdown product of diphenylhydrazine (i.e., azobenzene) because diphenylhydrazine is so unstable in water that it cannot be detected. The Agency for Toxic Substances and Disease Registry (ATSDR) toxicological profile[122] reports that analysis of 1,2-diphenylhydrazine in wastewater is "virtually meaningless" because, due to this oxidation, the concentration measured in the sample cannot be directly related to the actual concentration at the time of collection. A U.S. EPA study[123] referenced in the ATSDR toxicological profile reported that 1,2-diphenylhydrazine, ". . . instantaneously decomposes to azobenzene in the GC injection port," and therefore gas chromatography (GC) is not suitable for detecting 1,2-diphenylhydrazine.

Due to the uncertainties associated with the analytical method, it is inappropriate for the Regional Board to adopt a WQBEL at this time as the data are not valid or representative. Where data are not valid or representative, the SIP provides that, "[t]he RWQCB shall have discretion to consider if any data are inappropriate or insufficient for use in implementing this Policy." (SIP at p. 5.) Using this discretion, and based on the substantial information in the record, the Regional Board should follow step 8 of the SIP. Step 8 provides, "[i]f data are unavailable or insufficient, as described in section 1.2, to conduct the above analysis for the pollutant, or if all reported detection limits of the pollutant in the effluent are greater than or equal to the C value, the RWQCB shall require additional information for the pollutant in place of a water quality based effluent limitation." (SIP at p. 7.) Accordingly, the proposed final limit for 1,2-diphenylhydrazine should be removed from the Tentative Permit.

B. Receiving Water Limits

The Tentative Permit contains surface water limitations for receiving waters including receiving water limits set for DO. (Tentative Permit at pp. 16-18.) Here, the Tentative Permit includes two receiving water limits for DO that are not applicable to the Delta. The two limits in question are as follows:

a. The monthly median of the mean daily dissolved oxygen concentration to fall below 85 percent of saturation in the main water mass; and

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[122] ATSDR, 1990. Toxicological Profile for 1,2,-Diphenylhydrazine. Available at: http://www.atsdr.cdc.gov/toxprofiles/tp136.html.

[123] Riggin RM, Howard CC. 1982. *Determination of Benzidines in Industrial and Municipal Wastewaters*. U.S. EPA, Environmental Monitoring and Support Laboratory, Cincinnati, OH. EPA 6OO/S4-82-022.

b. The 95 percentile dissolved oxygen concentration to fall below 75 percent of saturation.

These requirements apply only to water bodies outside of the Delta. (Basin Plan at p. III-5.00.) The only DO water quality objective in the Basin Plan that applies in the Sacramento River downstream of the discharge is that DO shall not be reduced below 7.0 mg/L. (*Ibid*.) Accordingly, the two inapplicable water quality objectives expressed as receiving water limits should be removed from the Tentative Permit.

VII. WATER TEMPERATURE AND THERMAL PLAN

The Tentative Permit proposes effluent and receiving water limitations for water temperature that are the same as those in effect for the current permit for the District. (Sections IV.A.1.e and V.A.15.) The District submits that its requested adjustments to the existing limitations are supported by science and protective of beneficial use, as discussed and explained by Dr. Michael Bryan in an enclosure and in other materials provided to the Regional Board. Even if, notwithstanding the technical support for the modified exception proposed by the District, the Regional Board does not adopt the exceptions proposed by the District, the Regional Board should at minimum clarify the applicability of daily average to the effluent limitations. Finally, and critically, the Regional Board must conform the Fact sheet and Findings to the permit effluent and receiving water limitations, and prepare and process any necessary resolution for continued exception from the Thermal Plan.

A. The Exception Requested by the District Is Justified

The District has submitted the "Thermal Plan Exception Justification for the Sacramento Regional Wastewater Treatment Plant" (RBI 2010). The study documents and demonstrates in full that the District-proposed Thermal Plan exceptions to the Thermal Plan, which constitute slight adjustments to the existing exceptions in Order No. 5-00-188, meet the requirements for exception and waiver under CWA section 316(h). The Tentative Permit discusses a response of the U.S. Fish and Wildlife Service (USFWS) in a letter dated August 18, 2010. Subsequent to the release of the Tentative Permit, the National Marine Fisheries Service (NMFS) provided a letter which was received by the Regional Board on or about September 10, 2010. As discussed below, and further by Dr. Bryan in an enclosure, while the two letters support retention of the existing exception, they do not provide cause to disallow the exceptions requested by the District.

The NMFS letter states, on page 3, "*The aforementioned listed species* [winter-run Chinook salmon, spring-run Chinook salmon, steelhead, green sturgeon] *have sufficient swimming abilities to readily avoid the thermal component of this stressor*." (Emphasis added.) *The NMFS letter does not refute the technical findings of the RBI 2010, which technically justifies the requested exceptions because their granting would not adversely affect listed species under*

NMFS jurisdiction or their critical habitat, relative to meeting the Thermal Plan limits or relative to the existing exceptions. NMFS raises a concern about attraction of predatory fishes to the outfall site due to the thermal plume. However, it must be noted that the attraction of predatory fish to the warmer water exiting the diffuser, should it occur, would occur whether this facility is required to comply with the Thermal Plan objectives, the existing exceptions, or the requested exceptions. The very minor differences in thermal plume characteristics that could occur under the three regulatory scenarios cited above would not be sufficiently large to attract predatory fish under one scenario, but not the other. If predatory fish are attracted to the warmer plume, they will be attracted even if the discharge met the Thermal Plan objectives at all times, as a 20F differential is more than sufficient to influence predatory fish behavior, if behavior is actually affected by the plume. Thus, the issue of predatory holding at the outfall is separate and distinct from the question of whether the requested Thermal Plan exceptions have been adequately justified for direct thermal effects, and thus whether they can be permitted at this time. Holding the District to existing Thermal Plan exceptions, thereby creating periodic regulatory compliance and operational issues, will not affect whether predatory fish hold at the outfall location in elevated numbers.

Regarding the USFWS letter, the same realities pointed out above also are true for delta smelt. In addition, the USFWS letter identifies the reasons for decline of delta smelt as "*changes in outflow from the Delta, entrainment losses to water diversions, changes in food organisms, toxic substances, disease, competition and predation (USFWS 1995)*." The letter does not indicate that the thermal plume at the SRWTP outfall, or how it is regulated, is a cause for decline of delta smelt. In fact, the letter states, "*The information provided supports the District's conclusion that their current modeled thermal discharge does not impact the beneficial use criteria for the lower Sacrament River*." The letter goes on to state that "*The type of information needed to evaluate the effects of the proposed thermal exception on delta smelt is not present in the analysis, nor is any information about smelt behavior or its susceptibility to such conditions available in the existing body of science . . . . What is omitted is analysis of potential effects on migrating adult delta smelt during winter months and larvae during spring*." This is simply inaccurate. RBI 2010 assesses delta smelt as well as anadromous salmonids. (See RBI 2010 pp. 22, 32-34, 36-37, and 39.)

The USFWS letter recommends that the exception outlined in the 2000 permit should be retained and no further exception be granted, yet this letter does not: (1) recognize or technically refute the delta smelt specific assessment in RBI 2010, or (2) identify or evaluate the very minor differences in thermal plume characteristics that only occasionally occur between the 2000 permit exceptions and the District's requested exceptions. In fact, the thermal plume characteristics in the river under the 2000 exceptions and the District's requested exceptions are identical the vast majority of the time.

In short, the USFWS letter raises a question regarding need for fish behavioral studies, but *does not refute the technical findings of the RBI 2010, which technically justifies the requested exceptions consistent with CWA 316(a) requirements*.

Based on the fact that the District has technically justified its exceptions consistent with the requirements of CWA section 316(a) and the fact that this justification has not been refuted, the District requests that the Thermal Plan exceptions it has justified be granted in the renewed permit. If Regional Board staff intend to deny the justified Thermal Plan exceptions presently being requested, staff must produce a technical basis to warrant doing so, and should not simply ignore the District's formal 316(a) request because of questions raised about predation. The issue of predation should be considered separately, and should not interfere with a proper Thermal Plan waiver or 316(a) process.

If the Regional Board nonetheless chooses not to accept the District's proposed thermal provisions, it should at minimum state the effluent limitation as a daily average. Again, there is no technical analysis of any sort that would lead to denial of the request. But failure to grant the request poses significant operational problems and risk, as identified in a letter from the District dated August 11, 2010.

B. The Findings of the Fact Sheet Must Be Reconciled with Effluent and Receiving Water Limitations and Applicable Law and Regulations, and the Thermal Plan Exception Must Be Prepared and Approved

Under any circumstance, the District is concerned that the Fact Sheet (pp. F-78 - F-82) has not been reconciled with either the District's or the Tentative Permit's proposed effluent and receiving water limitations, and that appropriate findings (and resolution for exception to the Thermal Plan) are yet to be prepared. This is perhaps a function of the fact that responses from the resources agencies were received late in the process of preparing the Tentative Permit. But there is a need to prepare findings consistent with the decision to grant or continue the Thermal Plan exception and a waiver under section 316(a) of the CWA, and to prepare and process any appropriate resolution for exception to the Thermal Plan, with conditions consistent with the effluent and receiving water limitations included in the final permit. We urge the Regional Board to address these issues promptly. We also observe that the Fact Sheet on page F-82 refers to a TSO, but the draft TSO contains no provisions related to compliance with thermal requirements.

VIII. WHOLE EFFLUENT TOXICITY

A. Regional Board Incorrectly Calculates the Whole Effluent Toxicity Chronic Toxicity Trigger Using Steady State Approach

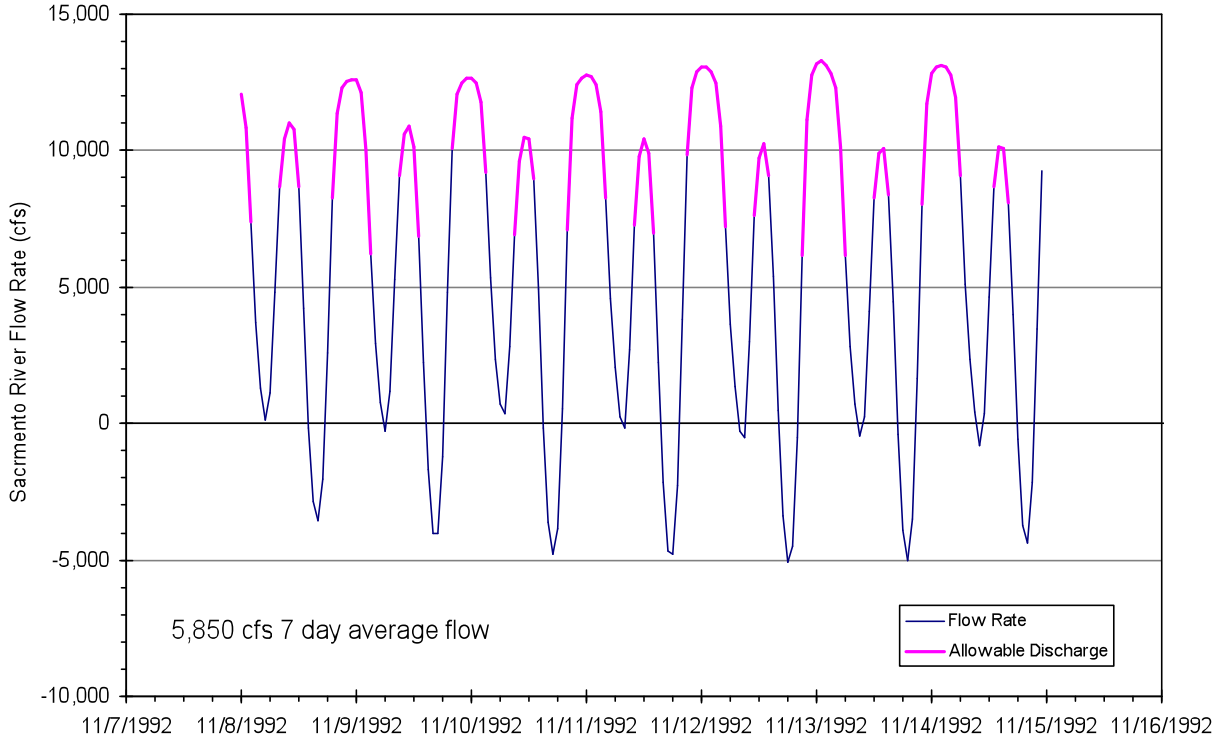
The Tentative Permit contains a numeric toxicity monitoring trigger of >6 TUc (where TUc = 100/NOEC). (Tentative Permit at p. F-109.) The trigger is calculated by estimating the chronic flow ratio based on the steady-state approach of dividing the 7Q10 river flow rate by the peak 4-day average effluent flow rate. The flow ratio is then used to determine the dilution at the edge of the chronic mixing zone—350 feet from the diffuser. At the 7Q10 flow rate of

5,840 cubic feet per second (cfs), the Sacramento River is subject to significant tidal effects, including reversals such that the SRWTP discharge is intermittent throughout the course of a day.[124] The Sacramento River flow rate averaging 5,850 cfs (i.e., 7Q10 flow conditions) for a 7-day period beginning November 8, 1992, is displayed in Figure VIII.1. Overlaid on the flow rates are the periods in the tidal cycle where SRWTP discharge may occur. Discharge at the 7Q10 condition is dynamic, with widely varying flow rates over the course of a day. Given the nature of the discharge at critical river flow rates, the District's dynamic model is the appropriate tool to assess the appropriate chronic toxicity monitoring trigger.

To determine the chronic toxicity trigger, the DYNTOX model is used to calculate the 4-day average percent effluent 350 feet from the diffuser. (Table VIII.1.) DYNTOX model results for the percent effluent are summarized in Table 3. The once in three-year occurrence for 4-day average percent effluent is 7.50%, corresponding to a dilution of 13.3 at the edge of the chronic mixing zone. Based on the dynamic model results, the District requests a numeric toxicity monitoring trigger of **>13 TUc** (where TUc = 100/NOEC). With a >13 TUc trigger, the Toxicity Reduction Evaluation (TRE) provisions in the Tentative Permit are triggered when the effluent exhibits toxicity at 7.7% effluent.

[124] The SRWTP is prohibited from discharging when the river:discharge ratio is less than 14:1 to account for tidal flow influences. Thus, SRWTP discharges are intermittent on any given day.

Figure VIII.1



Sacramento River Hourly Flow Rate and Allowable Discharge when 7-Day Average Flow Approximates the 7Q10 Value.

Table VIII.1: Dyntox Model Results for Percent Effluent 350 Feet from the SRWTP Diffuser at 181 mgd Scenario.

	4-Day Average 350 Feet from Diffuser	
Statistic	Percent Effluent	Dilution
Mean	3.93	25.5
Median	3.94	25.4
95%-ile	6.35	15.8
99.91%-ile	7.50	13.3
5%-ile	1.91	52.4

B. Concerns with Toxicity Reduction Evaluation Requirements

The Tentative Permit proposes requirements associated with Chronic Whole Effluent Toxicity. (Tentative Permit at pp. 25-27.) Concerns in addition to the appropriateness of the toxicity trigger described above in section VIII.A. are as follows:

The District requests that the requirement to prepare a TRE workplan within 90 days be revised to require an update of the existing TRE workplan that was submitted for the 2000 permit and has been in use since it was approved. (Tentative Permit at p. 25.)

The Tentative Permit proposes to require a TRE if accelerated monitoring results in 1 exceedance of the trigger. (Tentative Permit at p. 26.) This does not account for intermittent toxicity that can often occur and, because it is intermittent, its cause is very difficult to determine. A TRE is warranted if there is persistent toxicity. Therefore, the District requests that the requirement to initiate a TRE result if 2 accelerated tests exceed the trigger.

In addition, this section states that the Executive Officer may require a TRE even if accelerated monitoring does not result in any failed tests. The reason for this is stated as, "notwithstanding the accelerated monitoring results, adequate evidence of effluent toxicity . . . ." This vague rationale could not be predicted and does not allow for any discussion with or input by the District. At minimum, additional details and/or examples of what might constitute "adequate evidence" should be provided. TREs can be very difficult and very expensive under certain conditions (i.e., chronic toxicity, intermittent, variable intensity, and if toxicity is lost in stored samples) and, therefore, should be initiated only if evidence warrants.

C. It Is Inappropriate to Use *Hyalella Azteca (H. Azteca)* As a Test Species

With respect to the *H. azteca* special study in the Tentative Permit, the District has fundamental concerns with using *H. azteca* as a test species for toxicity in the water column. (Tentative Permit at pp. 28, F-104.)

1. *H. azteca* is epibenthic (lives on the sediment surface) and does not reside in the water column. These invertebrates show signs of stress when no substrate is present. Their life history led to a standard U.S. EPA method for sediment toxicity testing with *H. azteca* and, because the species is stressed away from sediment, water-only testing may not be appropriate or ecologically relevant.

2. Chronic toxicity measurements with *H. azteca* (i.e., growth) are not a very reliable test endpoint (see Werner et al. 2010a). It is possible that the Regional Board would require the development of an entirely new chronic test endpoint for *H. azteca* (i.e., the endpoint in the Weston research was paralysis which is not a common endpoint and is subjective in its determination). If the test duration and

endpoint are not known, then this modified test protocol would require extensive research development before being a useful method for NPDES permit reporting.

3. U.S. EPA has also noted that there are concerns with *H. azteca* as a toxicity test species.[125] This led to exclusion of *H. azteca* data from the acute and chronic ammonia criteria development. Specifically, data were not included because several laboratories have recently reported regular or intermittent difficulty obtaining consistent results and acceptable survival and growth of *H. azteca* during testing and culturing. At this time, the water quality conditions that promote optimal health are not known.

4. Based on the Weston research, whole effluent toxicity testing with *H. azteca* will almost certainly result in test failures. Toxicity testing in undiluted effluent is not environmentally relevant and, therefore, evaluating toxicity with this organism is not an appropriate approach. (See Written Testimony of Cameron A. Irvine at pp. 21-22.)

IX. PERMITTING OPTIONS

The Tentative Permit provides a number of NPDES permitting options as described in Tables 1 through 4 of the Tentative Permit Options. As discussed throughout, the District believes there are additional, significant issues associated with the Tentative Permit. However, below, the District summarizes the specific options from the identified permit options which it supports. (The alternatives are also addressed in preceding sections.) The following are the specifically identified options that the District supports based on consideration of the best available information, use of best available tools, compliance with all applicable rules, regulations and procedures, and consistent with the Regional Board's obligation under applicable law.

- Dilution Alternative 3 in Table 1: Adopt acute, chronic and human health mixing zones as proposed by the District. Utilize the District's dynamic modeling tool to derive WQBELs. Establish reasonable and achievable performance based limits where appropriate.

- Disinfection Alternative 1 in Table 2, as discussed in section I above, with coliform limits as a status weekly median.

[125] U.S. EPA, 2009. Draft 2009 Update Aquatic Life Ambient Water quality Criteria for Ammonia – Freshwater. EAP-822-D-09-001. December 2009 (p. 10).

- Dilution Alternative 3, Ammonia #2 in Table 3: Adopt concentration limits for ammonia based on the proposed acute and chronic mixing zones, and establish seasonal UOD mass limits to ensure future compliance with dissolved oxygen objectives in the Lower Sacramento River.

- Dilution Alternative 3, Nitrate #1 (an alternative that is not listed in Table 4): Adopt nitrate effluent limits based on the Primary MCL for nitrate and an appropriate dilution credit.

- Use Dilution Alternative 3 and the District's dynamic modeling tool to establish a defensible chronic toxicity testing trigger of >13.

X. STUDY REQUIREMENTS

A. *H. Azteca* Study

The Tentative Permit proposes to require the District to "conduct a study to develop procedures for conducting whole effluent toxicity (WET) testing using *Hyalella azteca* as the test species." (Tentative Permit at p. 28.) To support the study, the Tentative Permit finds that, "[t]here are indications that the discharge may contain constituents that are toxic to native species at very low levels.[126] *Hyalella azteca* is a native species in the Sacramento-San Joaquin Delta, it is sensitive to pyrethroids and it is an interface organism between sediment and the water column. Although testing with *Hyalella azteca* is not commonly used for wastewater effluent, it is a common species for determining toxicity in the Delta." (Tentative Permit at p. F-108.)

Requiring a discharger to conduct a study to develop an analytical method is not appropriate and well exceeds the Regional Board's authority. Studies for the development of test methods is an activity that is more appropriately conducted by or supported by U.S. EPA, which is the agency responsible for approving any test methodology before it can be used for permitting and compliance purposes. Typically, methods development requires the resources of a large government agency like the U.S. EPA, USGS, or a consensus body of experts like American Society of Testing and Materials (ASTM). It takes years to develop promulgated methods and it is unlikely that this method development would take a different path. Therefore, any method developed by the District under this requirement would be years away from becoming an approved method, and could be superseded by other efforts.

[126] Weston, Donald P., "Urban and Agricultural Sources of Pyrethroid Insecticides to the Sacramento-San Joaquin Delta of California," Environmental Science & Technology, Vol. 44, No. 5, 2010.

Further, the Tentative Permit's requirement for this study well exceeds the Regional Board's authority under Water Code section 13267. Water Code section 13267(b)(1) provides that, "[t]he regional board may require that any person who has discharged, . . . shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires." However, the Regional Board's authority under Water Code section 13267 is not unfettered. Any technical or monitoring program reports required pursuant to this authority must bear a reasonable relationship to the need for the report and the benefits to be obtained. (Wat. Code, § 13267(b)(1).) When requiring these reports, the Regional Board is required to provide a written request for the report and to identify the evidence necessary to support requiring the report. (*Ibid*.) Here, it has not been shown that the burden to be placed on the District for developing a new WET testing method using *H. azteca* is reasonable as compared to the need for the report.

The Tentative Permit also fails to provide any written explanation as to why the report is necessary, nor does it identify evidence supporting the requirement. The Tentative Permit merely states that, "[a] study is needed to determine if a 4 or 10 water column test for growth or 10 day survival or both growth and survival is best for determining toxicity." (Tentative Permit at p. F-108.) It provides no explanation or evidence as to why the District should be tasked with conducting this study of general applicability. For example, if the purpose is to develop a test for NPDES reporting of effluent toxicity, then the test will need to include acceptability criteria (e.g., Percent Minimum Significant Difference), inter-laboratory variability, and other elements that are considered in promulgated WET methods. These acceptability criteria would have to be developed by the District as part of method development studies and would represent a considerable effort and significant resources. As noted previously, development of WET testing methods is best done by, or under the control of U.S. EPA because it is the regulatory agency that must ultimately adopt the method as being appropriate for use in determining compliance with NPDES permits. It is not a reasonable study requirement to be placed on a single discharger like the District.

Considering the policy and technical concerns associated with this proposed study, it should be removed from the Tentative Permit.

B. Ammonia and Nitrogen Study

The Tentative Permit proposes to require the District to conduct studies of "existing and threatened impacts of ammonia and nitrogen on aquatic ecosystems in the Sacramento River, Delta, Suisun Bay and other potentially impacted waterbodies . . . ." (Tentative Permit at p. 27.) As explained, the purpose of the study is to "determine the location and magnitude of existing and threatened impacts on the aquatic ecosystem from ammonia and nitrogen in the discharge from the SRWTP." (Tentative Permit at p. K-7.) In conducting the study, the District would be required to coordinate with other NPDES dischargers of wastewater. (Tentative Permit at pp. 27, K-7.)

Like the *H. azteca* study above, the purpose of this study far exceeds the reasonable relationship and need for the study, and therefore its requirement exceeds Regional Board authority. This is especially true considering the fact that the Tentative Permit proposes to require the District to fully nitrify and denitrify effluent from the SRWTP. As described in the Tentative Permit, the study in question amounts to a lower Sacramento River and Delta-wide ammonia and nitrogen impacts study, which is extremely broad and significantly complex. (Tentative Permit at pp. 27, K-7.) To accomplish the goals of the study, the District would need to work with other NPDES permit holders. However, the District has no authority to require participation by other entities. The District is supportive of further research, and believes that a coordinated approach involving the many entities studying these issues including the District is appropriate. However, this proposed study, divorced from other efforts, is inappropriate. Further, if the District is required to fully nitrify and denitrify, it is particularly unreasonable for the District to conduct further study.

C. Pollution Prevention Studies

The Tentative Permit proposes to require a mercury pollution prevention plan and a salinity minimization and evaluation plan. (Tentative Permit at p. 29.)

As proposed, the requirement as it pertains to mercury, does not acknowledge the Pollution Prevention Plan for Mercury prepared by the District in 2001. Based on implementation of the 2001 Pollution Prevention plan, SRWTP effluent has realized substantial reductions in mercury effluent concentrations. In recognition of the previous efforts, the study requirement should be revised to require an "update" of its existing plan consistent with Water Code section 13263.3.

With respect to salinity, the Sacramento River is not impaired for salinity and the SRWTP discharge does not have reasonable potential to cause or contribute to an exceedance of salinity water quality objectives. The proposed performance-based effluent limit is intended to ensure the District maintains current levels of salinity, which do not impact beneficial uses. Because the District's salinity levels are sufficiently low, a Salinity Evaluation and Minimization Plan is not necessary or consistent with Water Code section 13267. Accordingly the District requests that this requirement be removed.

D. Temperature Study Requirement

The Tentative Permit proposes a temperature study that would be required to include: continuous monitoring of the thermal discharge in coordination with mixing zone monitoring; an evaluation using hydroacoustic technology to determine if there are aggregations of large fish or schools of small fish in the zone of elevated temperature; and, ambient water acute and chronic toxicity testing using rainbow trout bi-weekly during December and June for two-years, with control samples upstream and ambient river monitoring at 65 feet and 360 feet for acute and chronic toxicity tests respectively. (Tentative Permit at p. 28.) The District disagrees with the proposed study requirements for the following reasons, and overall the benefits to be gained by

implementing the study requirements does not bear a reasonable relationship as compared to the burden, including costs of the study requirement.

The proposed continuous monitoring requirement is duplicative of existing monitoring conducted by the District. Continuous monitoring for temperature of the effluent already occurs, and is proposed for continuation in the Tentative Permit. (Tentative Permit at p. E-6.) Thus, requiring continuous monitoring as part of a special study is not necessary.

The proposed requirement for evaluation using hydroacoustic technology is costly and also not necessary. The Tentative Permit proposes the Temperature Study in general to address perceived uncertainties with respect to aquatic life impacts in the vicinity of the discharge at existing thermal exemption conditions. (Tentative Permit at p. F-106.) However, as already discussed previously in section VII.A, ante, the District has provided sufficient justification for an exception to the Thermal Plan objectives. Further, fish attraction would not be affected by whether the SRWTP is required to comply directly with Thermal Plan objectives, the existing exceptions, or the requested exceptions. (Section VII.A, ante.) Thus, the proposed requirement provides no meaningful information with respect to maintaining existing exemptions, granting the requested exemptions are requiring compliance with the Thermal Plan objectives without an exemption. Moreover, fish distribution and abundance is affected by numerous factors of which temperature may be only one. Merely comparing fish aggregations cannot be assumed to provide relevant conclusions related to water temperature. Thus, the fish behavior study cannot be considered a reasonable requirement as compared to the burden for conducting the study.

The final two study requirements, acute and chronic toxicity testing with rainbow trout in the receiving water at 65 feet and 360 feet respectively, are also unnecessary. The Tentative Permit proposes to require the District to change its acute toxicity testing species from fathead minnow to rainbow trout in undiluted effluent. Assuming this change is implemented, the District will be able to determine if the undiluted effluent affects rainbow trout. If the undiluted effluent has no effects, it is not necessary to test in the river at 65 feet and 350 feet because there would be no basis for finding effects from the effluent in the river itself. Further, and as a practical matter, it would be infeasible to conduct flow-through acute toxicity testing and 24-hour composites for chronic testing as is required in the Tentative Permit under these proposed conditions. (Tentative Permit at pp. E-9 - E-10.) Thus, the proposed requirements here for the temperature study are infeasible, and would provide little benefit.

Considering the costs and burdens associated with the proposed temperature study in whole as compared to the need for the information, it is an unreasonable requirement. Accordingly, the temperature study requirement should be deleted from the Tentative Permit. Similarly, the reopener provision on page 25 of the Tentative Permit related to temperature studies (Provision VI.C.1.i) should be deleted.

XI. MONITORING AND REPORTING

In general, NPDES permits issued pursuant to the CWA are required to include monitoring and reporting requirements to assure compliance with permit effluent limitations. (See 40 C.F.R. § 122.44(i)(2); see also Wat. Code, §§ 13377, 13383.) Accordingly, the Tentative Permit proposes a Monitoring and Reporting Program (MRP) for the SRWTP in Attachment E. (Tentative Permit at pp. E-1 - E-26.) The MRP proposes monitoring requirements to assure compliance with the various permit limitations, and establishes certain additional monitoring requirements that are appropriate. However, the MRP also proposes monitoring requirements that exceed those required by federal law.

In adopting monitoring requirements beyond those required by federal regulation to assure compliance with permit effluent limitations, the Regional Board must comply with state law. Under state law, the Regional Board *may* require dischargers to investigate water quality and provide technical or monitoring program reports that document the water quality investigation. (Wat. Code, § 13267.) Thus, the Regional Board's authority under Water Code section 13267 is discretionary—not mandatory. Further, there are limits to the Regional Board's discretionary authority. When requiring water quality investigations and reports pursuant to this provision, the burden of the report, including costs, must bear a reasonable relationship to the need and the benefits to be obtained from the report. (*Ibid*.) In short, the Regional Board is not "mandated" to require additional monitoring, and any additional monitoring requested must be reasonable as compared to the burden and cost.

Here, the MRP in Attachment E of the Tentative Permit contains significant new monitoring requirements. Many of these new requirements may be difficult to implement, and it is uncertain what information will be gained by implementing some of these new requirements. In addition, the frequency and/or number of new constituents to be monitored will require the investment of significant additional resources. It should be noted that the District already has a robust monitoring program that collects and compiles data on a more frequent basis for more constituents than many Central Valley dischargers. The District estimates that the new requirements proposed in Attachment E of the Tentative Permit would cost an additional $1 million annually. This is the cost to conduct influent, effluent, water supply, and ambient monitoring along with reporting that is not currently included in the District's program. This more than doubles the District's current annual budget for monitoring and reporting of $597,000. However, the Tentative Permit fails to justify why many of the new requirements are reasonable as compared to the cost and the burden of conducting the additional monitoring. In addition, the Tentative Permit does not include "written explanation of the need for the reports" or "the evidence that supports requiring [the District] to provide the reports" as required by section 13267 of the Water Code.

Specific concerns that are discussed in more detail below include:

- Additional analyses to be conducted
- Additional Monitoring Locations
- Water supply monitoring study
- Revisions to specific requirements

A. Additional Analyses to Be Conducted

The number of constituents required in the MRP in the 2000 permit are compared to the number of constituents required in the Tentative Permit in Table XI.1. As can be seen, for each sampling event approximately 506 additional analyses are required. These include constituents for which there are no water quality standards including pyrethroids, non-CTR persistent chlorinated hydrocarbon pesticides, and several of the 'constituents of concern.' Receiving water monitoring was previously conducted for a subset of the priority pollutants (11 constituents) 3 days per year. This requirement is proposed to be changed from 3 days in the receiving water per year to 21 days per year for all 126 priority pollutants along with 6 pyrethroids, 22 non-CTR chlorinated pesticides and 30 other constituents of concern. While 21 days per year is already the number of sampling events required for the effluent, analyses for pyrethroids, non-CTR chlorinated pesticides, and most of the constituents of concern are new requirements. No rationale is found anywhere in the Tentative Permit for requiring monitoring for this exceptionally large number of constituents.

While some additional monitoring would be expected in the new permit, a review of recently adopted permits does not reveal any with an extensive list of chlorinated hydrocarbon pesticides or other constituents of concern. In addition, typical monitoring frequency for the full list of Priority Pollutants is once per year.

With respect to pyrethroids, this would be a new monitoring requirement that is being imposed for the first time on the District. No other Central Valley POTWs are required to monitor for pyrethroids. The cost and burden of monitoring for pyrethroids bears no reasonable relationship as compared to the benefit. First, pyrethroid monitoring in the effluent is not appropriate because there is no currently accepted U.S. EPA method for pyrethroid testing. Second, the Tentative Permit states that the rationale for monitoring pyrethroids is to determine reasonable potential. (Tentative Permit at p. F-103.) However, there are no adopted water quality objectives to determine reasonable potential for pyrethroids.

Table XI.1.

Monitoring Location	Number of Analyses in 2000 Permit	Table in Tentative Permit	Number of Analyses in Tentative Permit	Difference Between 2000 Permit and Tentative Permit
Influent	3	Table E-2a	5	2
Groundwater CAP	4 + priority pollutant metals	Table E-2b	6 + Title 22 metals	2
Effluent	23 +oxygenates (4)	Table E-3a	46	19
	priority pollutants + standard minerals	Table E-3b	6+priority pollutants (126)+pyrethroids (6)+standard minerals (9)+non-CTR chlorinated pesticides (22)+other constituents of concern (30)	64
ESBs	n/a	Table E-5	6	6
Receiving water (RSWU-1)		Table E-6a	10	10
Receiving water (RSWU-1)	17 + halogenated volatile organics (7)	Table E-6b	9+ priority pollutants (126)+pyrethroids (6)+standard minerals (9)+non-CTR chlorinated pesticides (22)+other constituents of concern (30)	178
Receiving Water (RSWD-2a, RSWD-2b, RSWD-4, RSWD-5)	n/a	Table E-6a	10 at R-4, R-5; 1 at R-2a, R-2b	22
Receiving Water (RSWD-2a,b / RSWD-3)		Table E-6a	10	10
Receiving Water (RSWD-3)	15 +halogenated volatile organics (7)	Table E-6b	9+ priority pollutants+pyrethroids (6)+standard minerals+non-CTR chlorinated pesticides (22)+other constituents of concern (30)	180
Municipal Water Supply	n/a		2+standard minerals	13
Total New Analyses				**506**

Besides pyrethroids, there are other significant concerns. Several of the other constituents of concern listed in Table E-3b and Table E-6b of the Tentative Permit are proposed for testing using drinking water methods. These methods are not approved for wastewater or surface water, and previous experience has shown them to be unreliable when used on wastewater or surface water. Therefore, the information obtained would have limited utility and the benefit is not reasonable as compared to the burden.

To avoid the unnecessary burden and expense, the District requests the following:

- Monitoring frequencies for priority pollutants be the same as in the current permit (i.e., 3 times/year for 7 days each in the effluent and 3 days/year in the receiving water).

- Monitoring frequencies for non-CTR chlorinated pesticides and other constituents of concern with water quality objectives be once per year.

- Monitoring for certain non-CTR chlorinated pesticides (2,4-D; 2,4-DB; 2,4,5-T; 2,4,5-TP; Dalapon, Dicamba, Dichloroprop, Dinoseb, MCPA, and MCPP) should be deleted. Laboratories do not commonly analyze for these compounds and special request would be required. Conversely, these compounds are not typically found in effluent and therefore monitoring for them is unnecessary.

- Constituents without approved wastewater methods and without water quality criteria (e.g., pyrethroids) be removed from the monitoring requirements.

- For certain constituents, monitoring should be conducted only through special studies and not be included in the MRP (e.g., perchlorate).

B. Additional Monitoring Locations

As can be seen in Table XI.1 above, there are 4 proposed additional monitoring locations in the receiving water plus 2 additional monitoring locations (i.e., municipal water supply and Emergency Storage Basins (ESBs)).

The new receiving water locations would be located at 60 feet (RSWD-002a), 350 feet (RSWD-002b), River Mile 44 (RSWD-004), and River Mile 43 (RSWD-005). While no specific explanations for the monitoring locations are provided, it appears that RSWD-002a and RSWD-002b are at the edge of the acute and chronic mixing zones respectively. In addition, RSWD-005 appears to be the location of the edge of the harmonic mean mixing zone. Considering that the acute mixing zone was not approved, it is not necessary or appropriate to require monitoring at that location. If the purpose is to collect information regarding the appropriateness of this mixing zone, then this should be a special study, not a monitoring requirement. Regardless of the rationale for each of these locations, there are difficulties associated with collecting weekly samples at these locations. The District's concerns are as follows:

1. The Tentative Permit proposes to require 7 consecutive days of sampling 3 times/year for receiving water sampling at RSWU-001 and RSWD-003. (Tentative Permit at p. E-14, fn. 1.) This requirement has both logistical and cost implications compared to the current permit, which requires only a 1 day sampling frequency at the river locations. The new requirement would result in a significant increase in cost and

sampling efforts. Additionally, Monday to Thursday sample collection does not allow for outside laboratories to receive samples in time and test samples within required holding times. Achieving required holding times would be highly improbable in a 7 consecutive day sampling scheme. Thus, the District requests that the 7 consecutive day sampling scheme be changed to match the 1-day sampling scheme in the current permit. This would allow the laboratories adequate time to adhere to the required hold times.

2. Continuous flow monitoring for additional receiving water stations (RSWD-004, RSWD-005) is not feasible. (Tentative Permit at pp. E-13 - E-14.) Continuous meters would have to be installed at these structures, which may not be permitted or allowed. It is requested that the Regional Board require continuous flow monitoring only at RSWU-001 where existing equipment currently records the river flow continuously.

3. Monitoring stations RSWD-002a and RSWD-002b are in-river monitoring locations. (Tentative Permit at p. E-4.) However, due to river currents and boat movements, it is difficult to collect a sample or measurement at exactly 60 feet or 350 feet, making it difficult to obtain a representative sample. The only parameter proposed to be measured at these locations is temperature. A more reliable approach is to monitor the effluent and RSWU-001 and use the dynamic model (which has been extensively field verified) to determine what the temperature would be at those locations. Thus, the District requests that the monitoring requirements at 60 feet and 350 feet be removed and be replaced with dynamic modeling to obtain the temperature profiles at these locations. We also request that monitoring at RSWD-004 and RSWD-005 be required no more often than quarterly.

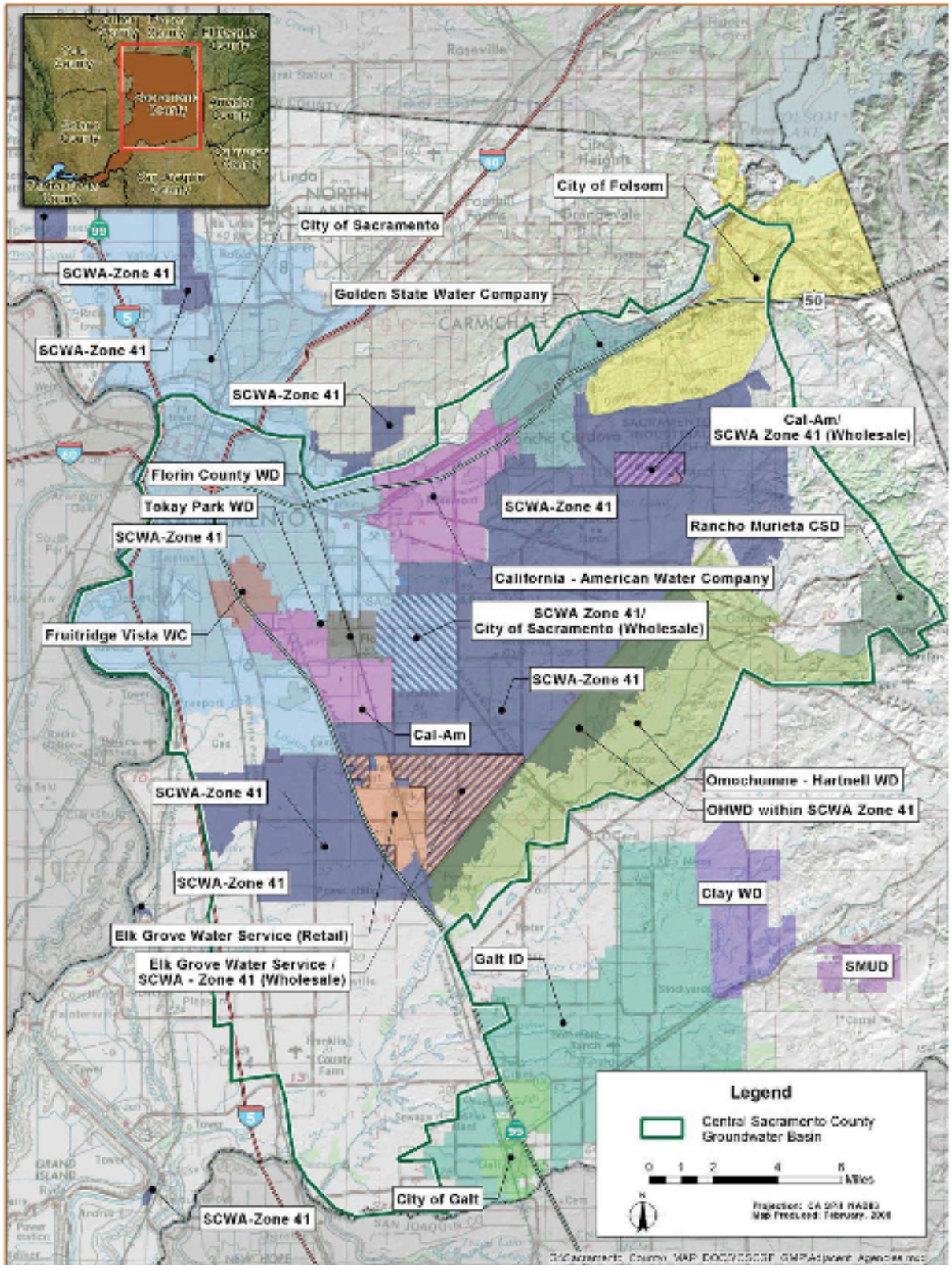
On another note, the Tentative Permit does not specify which downstream locations are to be used for compliance determination purposes. Considering the difficulties of collecting data at RSWD-002a and RSWD-002b, these samples are unlikely to be representative and should not be used for compliance. If the multiple downstream locations remain in the permit, it should be stated explicitly that compliance will be determined based on results at RSWD-003, or the difference between RSWU-001 and RSWD-003 only. Monitoring locations RSWD-004 and RSWD-005 are too far downstream and other inputs may influence the values measured at these locations making them unsuitable for compliance determinations.

C. Water Supply Monitoring Study

The MRP contains a proposed requirement to monitor the municipal water supply on an annual basis. (Tentative Permit at p. E-16.) It is noted that if there is more than one water supply, the sample may be composited or reported as a weighted average. Monitoring the municipal water supply for the District's service area is complex and, at best, unlikely to be representative and, at worst, infeasible altogether. It is not clear what meaningful information would be obtained through this effort. As noted in the Tentative Permit, the SRWTP discharge has relatively low salinity and does not have reasonable potential to cause or contribute to an exceedance of a water

quality objective. Therefore, efforts to obtain water supply quality data are not useful in characterizing influent loads for salinity or for other purposes. In addition, the representativeness or reliability of numbers obtained through this monitoring effort would be questionable due to the complexity of the water supply in the Sacramento area.

As shown in the map below, there are currently 20 water purveyors providing water to customers in the District's service area. None of these purveyors provide the bulk of the water supply. The proportion of the total water supply from each purveyor varies. At least some portion of the water supply from many of the purveyors is from groundwater, but it varies from year to year. For example, in 1992, the water supply to the District's service area was approximately 48% surface water and 52% groundwater. In 2008, the water supply was approximately 58% surface water and 42% groundwater. Thus, TDS levels vary between years and between water purveyors.


City of Folsom
City of Sacramento
SCWA-Zone 41
Golden State Water Company
SCWA-Zone 41
SCWA-Zone 41
Cal-Am/
SCWA Zone 41 (Wholesale)
Florin County WD
Tokay Park WD
SCWA-Zone 41
SCWA-Zone 41
Rancho Murieta CSD
California - American Water Company
Fruitridge Vista WC
SCWA Zone 41/
City of Sacramento (Wholesale)
SCWA-Zone 41
Cal-Am
Omochumne - Hartnell WD
OHWD within SCWA Zone 41
SCWA-Zone 41
SCWA-Zone 41
Clay WD
Elk Grove Water Service (Retail)
Elk Grove Water Service /
SCWA - Zone 41 (Wholesale)
Galt ID
SMUD
City of Galt
SCWA-Zone 41
Legend
Central Sacramento County
Groundwater Basin
0 1 2 4 6
Miles

Further, it would be physically difficult to composite 20 different water supplies. First, it is difficult to obtain permission from the water purveyors to collect these samples. This has proven to be an issue in the past for District staff. Next, it would also be almost impossible to obtain a representative composite sample because of the day-to day variability of surface water/groundwater ratios within the distribution system and varying water quality for each purveyor. Also, the data provided by the water purveyors in their annual reports is not necessarily representative of water quality. There is no simple approach for gathering the information, and even if gathered, it would not be representative.

Considering the cost and burdens in obtaining this information as compared to the negligible benefit, it is not supportable. Further, the effluent from the SRWTP is below applicable water quality standards and is not adversely affecting beneficial uses. Thus, the District requests that this monitoring requirement be removed.

D. Revisions to Specific Requirements

The following changes are requested to improve the efficiency and effectiveness of the MRP with respect to:

- Influent Monitoring
- Effluent Monitoring
- Toxicity Testing
- Reporting Requirements

1. Revisions to Influent Monitoring Requirements (p. E-5) Section III, Table E-2b:

- Table E-2b would require analysis for total ammonia nitrogen and total coliform. These analyses were not required by WDR 5-00-188. The District requests that these two parameters be removed from Groundwater Corrective Action Program (CAP) monitoring requirements.

2. Revisions to Effluent Monitoring Requirements (pp. E-6 - E-8) Section IV.A.1, Table E-3a:

- The MRP proposes to require monitoring for *Giardia* and *Cryptosporidium*. Such a requirement is inappropriate for several reasons. First, tests for *Giardia* and *Cryptosporidium* are very costly. Considering the fact that monitoring for these pathogens is not necessary to determine permit compliance, cost is a relative factor. As indicated above, the burden (i.e., costs) must be reasonable as compared to the benefit. For the benefit, there is none. Monitoring for *Cryptosporidium* and *Giardia* is not necessary to ensure compliance with the effluent limitations for total coliform. (See

Tentative Permit at pp. E-6, F-72 to F-76, F-102, F-104.) Further, levels of *Cryptosporidium* and *Giardia* in the effluent would not indicate what levels a drinking water intake would realize for the same parameters. Also, the accepted procedure for analyzing *Cryptosporidium* and *Giardia*, Method 1623, detects oocysts/cysts using microscopy (labeling with a specific antibody and an additional nucleic acid stain to confirm oocyst/cyst presence). This method detects *all* intact oocysts/cysts recovered from the water sample and does not provide information on whether the cells are alive or dead. Because this method provides no indication of the risk associated with protozoa in a water sample, it can overestimate the concentration of oocysts/cysts by detecting dead cells as "false positives." In other words, the monitoring information is of questionable value. Therefore, this monitoring requirement should be eliminated.

- The settleable solids monitoring frequency should be changed from a daily max (Grab) to a daily average (Composite). The return flows from diversion and/or growth in the sample lines can cause a grab sample not to be representative of effluent quality.

- The increase in monitoring frequency for Oil and Grease is excessive given that there is no reasonable potential and no effluent limit prescribed in the Tentative Permit. Historically, the District has never detected oil and grease in the effluent. Thus, reduced monitoring frequency to monthly, which is currently required, will still provide a representative and adequate characterization of the effluent.

- The once per week EC monitoring requirement is excessive, given that there is no reasonable potential and only an annual average limit is proposed in the Tentative Permit. The District requests that the monitoring frequency be changed to monthly.

- Increase in monitoring for certain pollutants from three times a year to once a month is excessive for those constituents that have no reasonable potential and permit limits (e.g., diazinon). Thus, the District recommends that the frequency be decreased to quarterly where there is no effluent limit or reasonable potential.

- The test method referenced for NDMA is applicable to drinking water. It is not appropriate to use this method to analyze wastewater. Although the wastewater method has detection limits greater than the criteria, drinking water methods are not reliable for wastewater due to likely interference from the complexity of the sample matrix. The District requests that the drinking water method for effluent testing be eliminated and such testing be conducted pursuant to U.S. EPA test methods for wastewater.

- The cyanide sampling type should be changed to a grab sample as cyanide is required to be preserved within 15 minutes of sample collection (as specified in footnote 9 on page E-8). A composite (24-hour) would exceed this hold time requirement.

- The Tentative Permit proposes to change the sample type from composite to grab for the constituents listed in Table XI.2. The District requests that the sample type be changed back to 24-hour composite samples to maintain consistency with the previous permit. Changing the sample type to grab samples will cause a loss of comparability with historical data.

Table XI.2.

Parameter	Tentative Permit Sample Type	District's Requested Sample Type
Mercury, total	Grab	24-hour composite
Mercury, methyl	Grab	24-hour composite
Pentachlorophenol	Grab	24-hour composite
Dibenzo (a,h) anthracene	Grab	24-hour composite
1,2 Diphenylhydrazine	Grab	24-hour composite
Bis-2 ethylhexylpthalate	Grab	24-hour composite
Alkalinity	Grab	24-hour composite

- The sample type for hardness should be changed to a 24-hr composite, to maintain consistency with metals sampling. (See Tentative Permit at p. E-8, fn. 8, Dissolved Copper - 24 hour Composite.)

(pp. E-6 - E-7) Section IV.B.1, Table E-3b:

- Priority Pollutants Footnote 3 – The previous permit excluded asbestos and dioxin testing from the CTR list. The District requests that these two parameters be excluded in the Tentative Permit. Dioxin testing should be consistent with the requirements in Attachment J.

- The MRP proposes to change the sample type from grab to 24-hour composite for the constituents listed in Table XI.3. The District requests that the sample types be changed back to a grab samples. The new 24-hour composite requirement will cause a loss of comparability with historical data.

Table XI.3.

Parameter	Tentative Permit Sample Type	District's Requested Sample Type
Cyanide	24-hour composite	Grab
dichloromethane	24-hour composite	Grab
chloroform	24-hour composite	Grab
tetrachloroethylene	24-hour composite	Grab
dichlorobromomethane	24-hour composite	Grab
dibromochloromethane	24-hour composite	Grab
1,4 dichlorobenzene	24-hour composite	Grab
carbon tetrachloride	24-hour composite	Grab
Di-isopropyl ether (DIPE)	24-hour composite	Grab
ethyl tertiary butyl ether (ETBE)	24-hour composite	Grab
Tertiary amyl methyl ether (TAME)	24-hour composite	Grab
methyl tertiary butyl ether (MTBE)	24-hour composite	Grab

- The sample type for standard minerals should be changed back to 24-hour composites. The new grab sample requirements will cause a loss of data trending and comparability.

Parameter	Tentative Permit Sample Type	District's Requested Sample Type
Standard minerals	Grab	24-hour composite

**(pp. E-6 - E-9) Section IV; (pp. E-13 - E-15) Section VIII;
(p. E-22) Section X.E; (p. I-1) Attachment I, Section I:**

- There appears to be significant overlap between frequency and constituent requirements for effluent and river monitoring in Attachment E (includes pretreatment program monitoring) and Attachments I and J. It should be acknowledged that whenever possible, sampling to meet one requirement should satisfy the requirements for any other, to avoid duplicative efforts and to reduce costs.

- The District requests that the proposed monitoring requirements for constituents with current studies underway (such as perchlorate and dioxins) be removed as the monitoring will be conducted as part of the special study. Once the study is completed, an evaluation

of whether there is reasonable potential can be made. The MRP could then be revised by the Executive Officer as necessary.

(pp. E-8 - E-9) Section IV.A.B, Table E-3b:

- There are two discrepancies in the proposed dioxin monitoring: Attachment E requires only 2 dioxin congeners be monitored 3 times/year for 7 days while Attachments I and J require that 1 sample in Dry Weather season and 1 sample in Wet Weather season be taken per year for all 17 congeners. This requirement to sample all 17 congeners twice per year as specified in Attachments I and J is consistent with other NPDES permits in the Central Valley. In comparison, requiring monitoring of 2 dioxin congeners 3 times/year for 7 consecutive days is costly. (See Tentative Permit at pp. I-2.B, F-45, and J-1, 2nd paragraph.) Also, the Tentative Permit requires testing for all 126 priority pollutants, which includes 2,3,7,8 TCDD. (Tentative Permit at p. E-8.) Accordingly, the District requests that all dioxin references in Attachment E be removed as monitoring for dioxin is adequately addressed in Attachment J. This will both simplify and clarify the monitoring requirements for dioxins. It is also requested that Attachment J be presented in the form of a Special Study that specifies that monitoring may be discontinued after 2 years if monitoring results are all non-detected values.

- Footnote 2 would require asbestos and dioxin testing from the CTR list. The previous permit excluded asbestos and dioxin testing from CTR list. The District requests that asbestos be excluded once again in the Tentative Permit. Dioxin testing is already addressed with study requirements in Attachment J.

- Footnote 8 would require monitoring for tributylin and radionuclides. The District has not routinely tested for tributylin in the past and has conducted only limited testing for radionuclides. The District requests that the monitoring requirements in the current permit be maintained for radionuclides, and that monitoring for tributyltin be required just once per year.

- To reduce costs and duplicative efforts, the District requests that the MRP explicitly state that when monthly testing overlaps with the required 3 sampling events/year, either one of the samples satisfies the other.

3. Toxicity Testing Requirements
(p. E-10) Section V.A.3:

The District originally requested 6 months from permit adoption to switch from fathead minnows to rainbow trout. However, because it may take significant changes to a flow through system to remove ammonia toxicity, the District requests that additional time be added to allow the change. Additional time is needed to adequately study different alternatives to remove ammonia toxicity

in acute toxicity testing for rainbow trout. With this, the District requests an additional 3 months for a total of 9 months.

(p. E-10) Section V.A.5:

The MRP would require the District to re-sample and re-test for acute toxicity as soon as possible but not to exceed 7-days. However, re-sampling and re-testing in the case of a test failure coincides with the District's weekly acute toxicity testing. The District conducts its testing within 7-days of the previous test. The District's Environmental Laboratory cannot run 2 flow-through tests at the same time, and there would be no point in running 2 tests concurrently because they would give the same result. Thus, the District requests that its normally scheduled weekly acute testing be considered to meet the re-sample and re-test provisions in the MRP.

(p. E-10) Section V.B.1:

Monthly WET testing for 3 species is a huge burden with little added value. Due to the extreme costs and limited benefit, the District requests that this requirement be reduced to quarterly testing per the existing permit.

(p. E-12) Sections V.D.1 and V.D.2:

- The requirement that a chronology of chronic and acute toxicity results be submitted along with monthly SMRs seems redundant when WET test results are submitted directly to the Regional Board. To reduce this duplicative effort, the District requests that the chronology submittal not be required.

4. River Monitoring
(p. E-14) Section VIII.A.2, Table E-6b:

- Monitoring is requested for RSWU-001 (Freeport) and RSWD-003, which is Cliffs Marina. The location for RSWD-003 is a new monitoring location as compared to the previous downstream receiving monitoring location. As such, the District requests clarification that this is the Regional Board's intent. It is requested that this be clarified, as Cliffs Marina would be a new sampling station.

- Footnote 8 for Other Constituents lists tributyltin and radionuclides. The District requests that these constituents be removed from the monitoring requirements for receiving waters.

5. Reporting Requirements
(p. E-17) Section X.C:

- The MRP requirements would require all monitoring results required to be submitted in the Self Monitoring Report (SMR). However, it is not always efficient or consistent with other requirements to submit all results with the SMR. For example, other than flow, results for the Groundwater CAP are currently submitted with the required biosolids reports. To avoid redundant reporting the District proposed that it not submit them with the SMR as well. Also, hardcopy reports of 3 times/year testing is reported separately when it is due, and not included in the monthly SMR as "No Sample."

(p. E-17) Section X.C, Table E-8:

- The SMR due date for the following constituents with monthly monitoring frequency may be problematic: Pentachlorophenol, Dibenzo(a,h) anthracene, 1,2 Diphenyl hydrazine, Chlorpyrifos, Diazinon, and NDMA. These constituents are sent out to specialized sub-contractors due to the low reporting limits. There is a potential for not being able to meet the required turnaround time specified in the reporting schedule. The District requests that the SMR due date for once a month be changed to first day of third calendar month following month of sampling to allow for the specialized reporting and sampling.

(p. E-21) Section X.E.3:

- The District has concerns with respect to the ability of laboratories to meet the proposed MLs and RLs. It is recommended that the Regional Board outline specifically how the data will be handled if a laboratory reports an inability to meeting method or reporting limit requirements. Additionally, requiring a report within 60 days that has all of the ML, MDLs, and methods is not reasonable. The first 60 days is not enough time to complete this, along with the myriad of other short-term requirements after the permit adoption. This will require working with many different laboratories that have contracts with the District to determine what their capabilities are. Also, the discharger should have the flexibility to select the laboratory that provides the best overall service and to change laboratories at its discretion, without locking itself into a set of laboratories reported in this report. The service of a laboratory may change and/or their ability to meet a certain ML or MDL. Thus, the District requests that the report be required in 90 days instead of 60.

(p. E-22) Section X.E.6a:

The District requests that the Pretreatment annual report due date be March 25 (not February 28) of each year to provide time for compilation of required data. Since the annual report includes data from sampling conducted in December of each year, the results of the data (including biosolids) may not be available until the middle of February. Additionally, District staff need time to adequately QA/QC the data and to input the data into the database.

(p. E-22) Section X.E.6a.i:

- The MRP would require a summary of analytical results to "consist of an annual full priority pollutant scan with quarterly samples analyzed only for those pollutants detected in the full scan." The District recommends a full priority pollutant scan be conducted annually, with detected pollutants being tested 2 more times to align with the 3 times/year effluent sampling. This would allow consistency with the effluent 3 times/year sampling events.

- The MRP would require sludge to be sampled. This type of sampling is a grab sample taken every 2 hours over 24-hours and highly energy intensive and very costly. Further, biosolids testing and reporting for the District's "sludge" are covered under separate WDRs. Thus, the District requests that this requirement be removed.

(p. E-22) Section X.E.6a.v.o:

- The MRP would require a quarterly compliance report for each industrial user with the 4th quarter incorporated into the annual report. On the other hand, 6.b requires a semi-annual compliance report (which would be the same as a 2nd quarter). These 2 proposed requirements are inconsistent and should be reconciled.

- It is requested that all references to quarterly reporting be removed and require annual (March 25) and semi-annual (July 31) reporting.

XII. OTHER PERMIT PROVISIONS

A. Completion of District's Application

The Tentative Permit states that the District's application "was deemed complete on 24 August 2010." (Tentative Permit at p. 4.) This sentence implies that the District did not complete its report of waste discharge (ROWD) until that date. However, and as noted directly in the Tentative Permit, that is not true. The Tentative Permit acknowledges that the District submitted its ROWD on February 1, 2005, which was in compliance with the Order No. 5-00-188. (Order No. 5-00-188, at p. 23, District was required to file its ROWD no later than 180 days in advance of August 1, 2005.) By submitting its ROWD timely, the District complied with applicable state and federal regulations, and Order No. 5-00-188 is administratively continued until such time that a new NPDES permit is adopted by the state. (See Cal. Code Regs., tit. 23, § 2235.4; see also 40 C.F.R. § 122.6.) The Regional Board has acknowledged the District's administrative extension in other documents (e.g., the Regional Board's Aquatic Life Issues Paper includes a footnote that states "[t]he expired permit has been administratively extended until the renewed

permit is adopted . . . .”). Thus, the statement in the Tentative Permit is misleading and should be removed or revised to say that a complete application was submitted on February 1, 2005.

B. Emergency Storage Basin Operating Requirements

The Tentative Permit includes a number of provisions with respect to operation of the ESBs. The last 2 proposed requirements would require that dissolved oxygen in the upper zone (1 foot) of wastewater not be less than 1.0 mg/L, and that the ponds shall not have a pH less than 6.5 or greater than 8.5. (Tentative Permit at p. 30.) These 2 proposed requirements are inconsistent with the intent and purpose of the ESBs. Also, they are not adopted with quality objectives and their application in these circumstances is not appropriate. As described in the Tentative Permit, the primary purpose of the ESBs in general is to store diverted influent flows above the SRWTP’s hydraulic capacity and to store diverted effluent flows to meet various conditions to comply with the NPDES permit. (Tentative Permit at p. F-14.) Thus, there may be times when influent and/or effluent stored in the ESBs does not meet the dissolved oxygen and pH requirements proposed.

However, failure to meet these proposed requirements in the ESBs will not defeat the purposes for which the requirements are being proposed. According to the Tentative Permit, the ESB requirements are to ensure proper operation and minimize any potential impacts to groundwater quality. (See Tentative Permit at p. F-113.) For dissolved oxygen, there are no groundwater concerns so the proposed requirement is presumably intended to ensure that objectionable odors will not emanate from the SRWTP. The SRWTP site encompasses a total of 3,500 acres of which actual facilities cover approximately 900 acres, including the ESBs. That leaves approximately 2,400 acres surrounding the facility. The extent and size of surrounding acreage acts as a buffer and provides odor control for all the SRWTP facilities.

With respect to pH, it is not necessary to require limitations of 6.5 and 8.5 to ensure proper operation or to minimize impacts to groundwater. (See Tentative Permit at p. F-113.) As explained in a memorandum from the District to Regional Board staff, 2 of the ESBs are lined (ESB-A and ESB-D). Thus, use of the lined basins for emergency storage is unlikely to have any impacts on groundwater quality. The other 3 basins (ESB-B, ESB-C, and ESB-E) are used infrequently, and in the case of ESB-E almost never. Thus, they too are unlikely to have any impacts on groundwater quality. To the extent the pH requirements are related to operation of ESBs for odor control, the requirement is unnecessary for the same reasons expressed immediately above with dissolved oxygen. Considering the lack of risk to groundwater or the need employ such requirements for odor control, these two provisions should be removed from the Tentative Permit.

C. Collection System & Sanitary Sewer Overflows

The Tentative Permit includes provisions related to sanitary sewer overflows (SSOs) from the collection system. Specifically, it proposes to include the District's collection system as part of the treatment system subject to the provisions of the Tentative Permit, and also suggests that sanitary sewer overflows are prohibited by the Tentative Permit. (Tentative Permit at pp. 30-31, E-21.) The District is opposed to the proposed provisions and the provisions need to be removed and modified for the following reasons.

The District's collection system (which consists only of main trunk lines and interceptors as compared to the thousands of miles of pipeline owned and operated by the District's sister agency Sacramento Area Sanitation District) is subject to the State Board's Statewide General WDR for Sanitary Sewer Overflows (State Board Order No. 2006-0003), and Porter-Cologne in general. Further, to the extent that SSOs reach waters of the United States, such SSOs are subject to the CWA. Accordingly, the District's obligations and liabilities associated with ownership and operation of its limited collection system facilities are governed by other orders and requirements. It is unnecessary and inappropriate to subject these same facilities to new and additional obligations or liabilities under the Tentative Permit. Stating that the District's collection system is "part of the treatment system that is subject to this Order" could create confusion as to the source of the District's responsibilities. The Tentative Permit should be revised accordingly. To that end, we suggest that the first full paragraph on page 31 of the Tentative Permit be removed in its entirety. Further, we suggest that the Tentative Permit be revised to make clear that the District's collection facilities are subject to the requirements of State Board Order No. 2006-0003 and applicable law and that this permit does not, and is not intended to, create new or additional requirements, obligations or liabilities for the District with respect to SSOs from the collection system, and that the District's obligations and potential liabilities are defined by State Board Order No. 2006-0003 (and any successor) and applicable State and federal law.

The Tentative Permit should also be revised so that it no longer implies that SSOs are prohibited by the permit itself. (Tentative Permit at p. E-21.) The suggested changes are consistent with recent communications between the Regional Board's Executive Officer and representatives of the Central Valley Clean Water Association where the Executive Officer indicated that SSO prohibition language in NPDES permits would be eliminated because State Board Order No. 2006-0003 is controlling on this issue.

XIII. PERMIT RENEWAL APPLICATION DEADLINE

Table 3 of the Tentative Permit lists the deadline for submitting the ROWD as "3 years prior to the Order expiration date." This is 2.5 years sooner than the typical deadline of 180 days prior to expiration of the permit. The District submits that this is unreasonable and inefficient, and an inappropriate burden. To require the ROWD after only 2 years in the permit term would likely

result in the information provided with the ROWD to be incomplete. Also, because the ROWD is requested so soon after permit adoption, the information in the ROWD will be stale by the time the permit is renewed.

For example, if the ROWD is submitted in 2012, the studies proposed in the Tentative Permit will be in their initial phases, resulting in no useful information being available for the permit renewal process. In addition, to meet the minimum data requirement on the federal Form 2A, at least 1 year of data included in the ROWD may need to be from the time period prior to permit issuance.[127] For many constituents not included in the previous permit, the data set will be limited to 2 years of data.

If the permit is renewed in five years, a 2-year data set in the ROWD would likely need to be updated with more recent data. The District's data set is robust (e.g., the 2005-2008 effluent data set contained 37-205 data points per constituent, with most constituents having 73 or more data points). Compiling the data for submittal is a complex and resource intensive undertaking. Conducting this activity twice would be an unnecessary expenditure, especially since there is no valid reason for requiring the ROWD 2 years into the permit cycle.

Although it seems unlikely, if the proposed submittal date may relate to a desire to renew the permit sooner than 5 years after issuance, the District submits this would be highly inefficient. If a pressing need arose to address an issue during the life of the permit, the permit could be reopened.

The District requests that the ROWD due date be listed as 180 days prior to expiration of the permit, consistent with typical practice.

XIV. FURTHER SPECIFIC COMMENTS AND CORRECTIONS

A. Limitations and Discharge Requirements

The District requests the following language clarifications, corrections, and minor edits to the Limitations and Discharge Requirements in the Tentative Permit:

- Page 1, Table 2. In the Effluent Description, "Domestic Wastewater" does not accurately characterize the effluent. Suggest replacing with "~~Domestic Wastewater~~ Disinfected Secondary Treated Wastewater".

[127] U.S. EPA's NPDES Form 2A, which is applicable to POTWs, requires at least 3 effluent samples and that such samples not be more than 4½ years apart. For constituents monitored annually, there would not be sufficient data to properly meet the requirements of Form 2A.

- Page 4, Table 4. In this table, it states that the "Facility Design Flow" is 181 mgd. In fact, the 181 mgd is the permitted flow, which is not necessarily consistent with the facility design flow. The District recommends replacing the term "Facility Design Flow" with "Facility Permitted Flow".

- Page 4, II.A. "The Discharger provides sewerage service to the Cities of Sacramento, Folsom, West Sacramento, and the Sacramento Area Sewer District service area. The Sacramento Area Sewer District service area includes the Cities of Elk Grove, Rancho Cordova, Citrus Heights, Courtland, and Walnut Grove, as well as, portions of the unincorporated areas of Sacramento County."

- Page 5, II.B. "Solids handling consists of dissolved air flotation thickeners, gravity belt thickeners, anaerobic digesters and sludge stabilization basins with disposal on-site through land application or biosolids recycling facility."

- Page 5, II.B. "The Discharger is currently permitted to treat 5.0 mgd of wastewater at the Water Reclamation Facility (WRF) for unrestricted use, with a provision for Facility expansion to 10 mgd."

- Page 8, Paragraph 2. "steehead" should be "Steelhead".

- Page 12, III.B. This states that the bypass or overflow of wastes to surface waters is prohibited, with bypass defined as the intentional diversion of waste streams from any portion of a treatment facility, according to page D-2. Order 5-00-188 has a similar provision on page 12, but specifically exempts the CAP discharge as follows: "The by-pass or overflow of wastes to surface waters is prohibited, except as allowed by Standard Provision A.13 in "Standard Provisions and Reporting Requirements for Waste Discharge Requirements (NPDES)" and as described in Finding No. 13." Finding No. 13 of Order 5-00-188 states, in part, "Discharging water from the CAP system downstream of the secondary clarifiers is acceptable and does not decrease the amount of treatment as the treatment processes upstream of this discharge point are not designed for removal of the CAP discharge constituents of concern." The permit language should be revised to resemble Order 5-00-188 so that the discharge of the CAP system is not affected by this provision.

- Page 14, IV.A.1.i, j, and k. Confirm that the calculation for determining compliance with the annual average limits for total recoverable aluminum, electrical conductivity, and mercury load is a January through December average.

- Page 14, IV.A.1.e. The MRP requires temperature readings to be collected at three depths from the boat as grab samples in the Sacramento River. Currently, temperature readings are only collected from 1 depth and are used to determine compliance with the 20 and 25 degree limits. Collecting temperature data from 2 additional depths does not

provide any significant benefit and will complicate sampling and compliance calculations. Thus, we request that sampling be required at only 1 depth.

- Page 15, IV.A.2.a, Table 7. The interim total coliform limit specified on page 15 and further defined on page 35 is listed as a rolling median. The current permit has a static week limit of Sunday through Saturday. The new rolling median would be difficult to ensure consistent compliance and is unnecessary. The purpose of interim effluent limits is to ensure consistent compliance while actions are being taken to comply with final effluent limits. Thus, and subject to the comments in section I above, the interim effluent limit should be adjusted to be a static weekly median and not a rolling median.

- Page 16, V.A. Specify which river sampling locations should be used for compliance purposes with receiving water limitations.

- Page 26, VI.C.2.a.iv.c and page E-12, V.D.1. The section states that WET reports are due within 30 days following the completion of the test. It may be difficult to produce reports within 30 days due to holidays and staffing issues. Please revise the sentence to state: "30 business days".

- Page 28, VI.C.2.e.iv. Change to "rainbow trout" not "reainbow".

- Page 30, VI.C.4.c.iv. This sentence should be revised, since the basins are designed to overflow to each other. It should state: "Freeboard for the total ESB system shall never be less than 2 feet (measured vertically to the lowest point of overflow)."

- Page 35, VII.D. There is no reference to the words "lowest consecutive" in the description of dry weather months. "Average dry weather flow" should be defined as the average flow of three lowest consecutive months. We request that any reference to groundwater or runoff be removed from the definition.

- Page 36, VII.G. "Chronic Whole Effluent Toxicity Effluent Limitation (Section IV.A.1.<x>)." "<x>" should be replaced with "c".

B. Attachment A – Definitions

The District requests that the following phrases be given definitions in Attachment A:

- Geometric mean

- Total recoverable metals (as distinct from "total" metals)

- Suspended Sediments

- Suspended Materials

C. Attachment C – Flow Schematic

Replace Attachment C with an updated flow schematic.

D. Attachment D – Standard Provisions

The formatting throughout this section is inconsistent and therefore creates confusion as to the applicability of certain requirements. Additionally, the primary heading references for the first 5 sections are identified with an Arabic number (e.g., 1, 2, 3, 4), but the remaining two sections are identified with roman numerals (e.g., VI, VII). Using both styles for the same level of heading creates confusion. The District recommends that the formatting and headings be corrected.

E. Attachment E – Monitoring and Reporting Program

The District requests the following language clarifications, corrections, and minor edits to the Monitoring and Reporting Program (MRP), Attachment E:

- Page E-4, II, Table E-1. Monitoring station INF-001 is required to be located before "…any additives, treatment processes, and plant return flows." It would be difficult to relocate this monitoring location to comply with the description as proposed. Instead, we recommend that the description be changed to describe the current monitoring location as follows: "after pre-chlorination, ESB return flows, and also includes supernate return flow from the SSBs."

- The station called INF-002 in Table E-1 is not an influent monitoring station and should be renamed to reflect this. It is the groundwater CAP monitoring station and discharges into either the secondary effluent channel or to the wetlands. The station name could be changed to "CAP-001".

- The monitoring station description for EFF-001 is incorrect. The description should be corrected as follows: "Location where a representative sample of the facility's ~~influent~~ effluent can be obtained."

- As discussed in Section X, Monitoring and Reporting, the District has requested that this monitoring requirement be removed. However, if it remains, monitoring station SPL-001, municipal water supply, is referenced on page E-16. This station is not included in Table E-1, therefore its location is unclear.

- Page E-5, III. The section lettering on this page includes two sections III.B. The first one should be changed to III.A.a.

- Page E-5, III.B, Table E-2b. There are footnote links attached to Nitrogen, Total (as N) (footnote 5) and Ammonia Nitrogen, Total (as N) (footnote 3), which have no corresponding footnotes below the table. The footnote references should either be removed, or footnotes added (and re-number them, as there are no footnotes 2 or 4).

- If the two footnotes described above (3 and 5, but not footnote 1) are linked to the footnotes in Table E-3a, footnote 3 would require WET testing to be conducted concurrently with ammonia monitoring at INF-002. This requirement should not apply to CAP monitoring, so the link to footnote 3 should be deleted.

- Pages E-6 through E-8. IV.A.1, Table E-3a.

    - Temperature is listed twice, with two monitoring locations (final effluent and discharge point). The continuous temperature requirement is linked to footnote 2, which specifies that "Effluent temperature monitoring shall be at the Discharge Point location." This location should be changed to specify final effluent EFF-001 (i.e., delete footnote 2).

    - For turbidity (if requirement is retained), a footnote should be added that states, "[u]pon compliance with Special Provisions VI.C.6.a. in the Permit, location for measurement of effluent turbidity may change due to change in disinfection systems."

    - Ammonia, nitrate, and nitrite are listed as composite samples. To meet preservation requirements, samples should be collected as a grab. A grab temperature sample should also be collected at the same time.

    - The cyanide sample type is listed as a 24 hour composite. The required analytical test method is linked to footnote 9, which states "As specified in 40 CFR Part 136; or samples taken at the effluent without preservatives, may be analyzed for cyanide within 15 minutes from collection and must be performed by a laboratory certified for such analyses by the State Department of Public Health." A 24-hour composite would exceed the 15-minute analysis hold time necessary for the second option provided here. The preservation of cyanide samples has been shown to lead to falsely elevated cyanide concentrations. To comply with the necessary hold time for the second option, the sample type should be changed to "24-hr composite or grab sample (with sample analysis within 15 minutes)." This is also discussed in section XI, ante.

    - Effluent/River Dilution should be a continuous calculation, not meter reading.

    - In case of composite sample breakage, composite sampling should include an option for grab sampling, or no results will be available for that sample.

- Footnote 1 regarding total residual chlorine: The current meters are calibrated to 0.1 mg/L and the permit is requesting 0.01 mg/L. This accuracy currently cannot be achieved with the current span setting on the analyzer. Request that this calibration accuracy be stated as 0.1 mg/L.

- Footnote 10 requires running 12 month summary to be reported monthly. This requirement is redundant and adds no benefit. We propose that only diversions for that DMR submittal period be included.

- Page E-8 and E-9, Table E-3b.

  - Weekly monitoring for EC and TDS is required in Table E-3a. Because of this weekly monitoring, the 3x/year monitoring requirements in Table E-3b are unnecessary and should be removed.

  - 1,2,3,6,7,8-HpCDD is missing a "4". It should be 1,2,3,4,6,7,8-HpCDD.

  - Semi-annual monitoring for dioxin is required by Attachment I (page I-2, II.B) and Attachment J. Because of this semi-annual monitoring, the 3x/year monitoring requirements for OCDD and 1,2,3,4,6,7,8-HpCDD in Table E-3b are unnecessary and should be removed.

  - Footnote 2 is out of place: "Chlorpyrifos and diazinon shall be sampled using EPA Method 625M, Method 8141, or equivalent GC/MS Method." There are no sampling requirements for chlorpyrifos or diazinon in Table E-3b and there is no footnote 2 within the table. Perhaps this footnote applies to Table E-3a or Table E-6b, and the footnotes should be re-ordered.

  - In footnote 7, "permtethrin" should be "permethrin".

  - In footnote 8, "flouride" should be "fluoride", and "1,1,2-trichloro-1,2,2-trifluoromethane" should be "1,1,2-trichloro-1,2,2-trifluoro~~m~~ethane".

- Page E-11, V.B.7, Table E-4. The percent dilution for chronic toxicity testing should include a 100% effluent scenario. Also, it should be further clarified that upstream receiving water (RSWU-001) is to be used as control.

- Page E-13, VI.A.1. For clarity, please insert the following into this provision: "The Discharger shall monitor diverted influent or treated effluent at the Emergency Storage Basins, when present, as follows:".

- Continuous flow meters are not currently installed on each basin (only D), and because basins A, B, and C are connected, continuous meters are not practical. Thus, we

recommend replacing "Meter" in Sample Type with "Level" and replacing "Continuous" in Sampling Frequency with "Daily".

- Page E-13, Table E-6a.
  - For clarity, please add a link to footnote 1 to pH and temperature.
  - The "3" in "Alkalinity (as CaCO3)" should be a subscript, not a superscript.
  - Remove the link to footnote 5 from the grab sample designation for ammonia. There is no footnote 5 in Table E-6a.
  - Remove footnote 2. It appears to be a fragment and there is no link to footnote 2 in the table.
- Pages E-14 and E-15, VIII.A.2, Table E-6b.
  - "Diazonon" should be "Diazinon".
  - Perchlorate is listed twice, in two separate rows.
  - In footnote 1, it states that "monthly receiving water samples are taken for the Coordinated Monitoring Program." To clarify, Coordinated Monitoring Program (CMP) samples are collected three times per year and during storm events. Thus, please remove the word "monthly" from footnote 1.
  - In footnote 5, "permtethrin" should be "permethrin".
  - In footnote 6, "flouride" should be "fluoride", and "1,1,2-trichloro-1,2,2-trifluoromethane" should be "1,1,2-trichloro-1,2,2-trifluoro~~m~~ethane".
- Page E-16, X. There is no section X.A, the first section under X is B.
- Page E-22, X.E.6a.i. All requirements for biosolids testing and reporting are adequately covered under separate WDRs. Thus, all references to sludge sampling should be removed and references to the appropriate WDR, as in IX.A, should be added. For example, revised language should state: "Biosolids testing and reporting shall be conducted in accordance with Waste Discharge Requirements Order No. R5-2003-0076 or subsequent Orders that regulate the disposal of biosolids."

F. Attachment F – Fact Sheet

The District requests the following language clarifications, corrections, and minor edits to Attachment F:

- Page F-4, II.A. For the facility description language in section A, we recommend the following revisions: "The Facility is staffed and operated 24 hours per day and consists of influent pumps, septage receiving station, mechanical bar screening; aerated grit handling, grit classifiers that wash and dewater grit, covered primary sedimentation tanks, pure oxygen biological treatment by activated sludge, secondary sedimentation, disinfection with chlorine gas ~~sodium hypochlorite~~ and dechlorination with sulfur dioxide. Effluent can be diverted to lined and unlined emergency storage basins as needed to meet effluent dilution, thermal, and disinfection requirements or divert excess flows. Odors are controlled through stripping towers and carbon treatment. Solids are thickened by dissolved air floatation and gravity belt thickeners. Primary and secondary sludge is mixed and sent to anaerobic digesters for approximately fifteen days or more, stored at the solids storage basins for three to five years then harvested and injected into lined dedicated land disposal sites. Some biosolids are recycled with the Synagro Organic Fertilizer Company and the Discharger can dispose of biosolids at the Keifer Landfill as an emergency disposal option. Separate Waste Discharge Requirements (Order No. R5-2003-0076) in conformance with Title 27, California Code of Regulations, Division 2, Subdivision 1 cover the biosolids and solids storage and disposal facilities, the Class II dedicated land treatment units, unclassified solids storage basins, the Class III grit and screenings landfill closure and the groundwater Corrective Action Program (CAP)."

- Page F-7, II.C, Table F-2. The concentration units for bis(2-ethylhexyl)phthalate limits should be µg/L, not mg/L.

- Page F-8, II.D. The District does not agree with the number of violations for acute aquatic toxicity listed in the compliance summary table. To clarify the numbers, a footnote should be linked to the 6 violations in 2008, stating, "In 2008, 3 of the violations were exceedances of the single test, 70% survival limit, and SRWTP also reported one additional monthly 90% median violation (4 total violations reported). The Regional Board assessed 3 violations based on its interpretation of the 90% median of 3 consecutive tests." Another footnote should be linked to the 9 violations in 2009, stating, "In 2009, 2 of the violations were exceedances of the single test, 70% survival limit, and SRWTP also reported one additional monthly 90% median violation (3 total violations). The Regional Board assessed 7 violations based on its interpretation of the 90% median of 3 consecutive tests."

- Page F-13, III.D.2. The section reference under Table F-3 is incorrect. Revise as follows: "A pollutant-by-pollutant evaluation of each pollutant of concern is described in sections IV.C.2.c and IV.C.2.d.vi, IV.C.3.b,c,d, IV.C.4, IV.C.5, and IV.D.6, ~~VI.C.3~~ of this Fact Sheet." There is no section VI.C.3 in the Fact Sheet.

- Page F-14, III.E.1. Revise as follows: "In ~~June~~ July 2009, the District installed six new wells to monitor groundwater water quality."

- Page F-14, III.E.3. Revise as follows: Corrective Action Program (CAP). During the 1990's the groundwater beneath the DLDs were found to be impacted by elevated concentrations of nitrates, chlorides and total dissolved solids (TDS). To mitigate the impacted groundwater, the Class III landfill that took grit and screenings was closed and the DLDs were either lined or closed. The District implemented a Corrective Action Program in December 1995 to remediate the impacted groundwater and it consisted of extraction wells down gradient of the DLDs. The extraction wells keep the groundwater from migrating off the Facility site. The groundwater is discharged downstream of ~~to~~ the secondary clarifiers of the WWTP where it continues through the remaining treatment processes and discharged to the Sacramento River or to the Wetlands. The CAP is operational and is regulated under Order No. R5-2003-0076, Sacramento Regional County Sanitation District Biosolids and Solids Storage and Disposal Facilities.

- Page F-26, IV.C.2.c.i.(b). Please correct the following, "m, b = criterion specific constants (from CTR) ~~san jose~~".

- Page F-32, IV.C.2.d.ii. All references here and elsewhere to "Flow Sciences Inc" should be changed to "Flow Science Incorporated".

- Page F-40, IV.C.2.d.vi, Table F-12. Please correct footnote to state "effluent cyanide" versus effluent copper.

- Page F-46, F.IV.C.3.b.ii. The first paragraph states "The Reporting and Monitoring Program requires perchlorate be sampled three times per year." However, in Attachment E Table E-3a, monthly monitoring is required for perchlorate. The language in this section should be changed to "requires perchlorate be sampled monthly."

- Page F-60, IV.C.3.d.vi.(d) and subsequent sections (d). Please correct the sentence in the Plant Performance and Attainability section, which incorrectly states "is less than to" versus "is less than". This correction should be made in other subsequent identical sentences in other constituent sections.

- Page F-67, IV.C.3.d.xvii. The units for chlorine limits should be mg/L, not ug/L. In all other locations (e.g., pages 14, F-7, and F-86), they are correctly listed as mg/L.

- Page F-82, IV.C.3d.xxiv.(d). This section states that "a compliance time schedule for compliance with the temperature effluent limitations is established in TSO No. R5-2010-XXXX in accordance with CWC section 13300," however it is not included in the TSO. Thus, this sentence should be deleted.

- Page F-85, IV.C.4, Table F-17. The aluminum limit in the table is for "Aluminum, total," but the effluent limitation in the discharge requirements is for "Aluminum, total recoverable."

- Page F-85. The section numbering on this page is inconsistent with the page before. The previous section number was f.(3) and the next section number after Table F-17 is b. There are two of each section 4.b, 4.c, 4.d, 4.e, and 4.f.

- Page F-94, IV.D.4, Table F-19. Mean concentrations are included in this table for constituents with no detected data, but there is no indication that the data are all non-detected. These concentrations should be flagged as "less than" or replaced with "ND". This applies to the mean values at R-1 for bromodichloromethane, chloroethane, dibromochloromethane, methylene chloride, 1,4-dichlorobenzene, NDMA, and BOD.

- Page F-96, IV.D.6, Table F-20. No units are provided with this table.

- Page F-102, VI.A.1. The influent monitoring frequency for electrical conductivity is inconsistent with the MRP. Revise the language as follows: "electrical conductivity (once per ~~day~~ month)."

- Page F-103, VI.B. The numbered sections 5 through 9 have been over-indented.

- Page F-104, VI.C.1. Acute Toxicity. This section states that "In addition to rainbow trout, *Hyalella azteca*, an amphipod, is a resident species in the Sacramento-San Joaquin Delta and is an appropriate indicator organism for detecting pyrethroid toxicity." The District recommends removing the reference to *Hyalella azteca* in this paragraph, as it has no bearing on the acute toxicity requirements.

- Page F-104, VI.D.2. Groundwater. This section should be removed, as no groundwater monitoring is required by the Tentative Permit and no groundwater locations are listed in the MRP.

G. Attachment I – Effluent and Receiving Water Characterization Study

This study is redundant with monitoring required under Tables E-3a, E-3b, E-6a, and E-6b of the MRP and with monitoring required in Attachment J. It is requested that this study include only the constituents that are not included in Attachments E or J.

Other corrections and minor edits to Attachment I include:

- Page I-1, II.A. It is redundant and unnecessary to require data that is being reported on a quarterly basis (e.g., 3 times per year monitoring) to also be provided in a separate report. This should be deleted.

- RSW-001 is not a listed monitoring location. The correct location is "RSWU-001".

- Page I-2, Table I-1. The quantifiable limit at the District's lab for acrolein, constituent 17, is 2.5 µg/L, not 2 µg/L.

H. Tentative NPDES Permitting Options

The permittee requests the following language clarification to the Tentative NPDES Permitted Options submitted with the Tentative Permit:

- Page 2. Under Dilution alternative 2, human carcinogen criteria only: The risk is listed for someone consuming 2L/year for 70 years. We suggest that the correct reference is 2L/day for 70 years.

XV. ACCOMPANYING MATERIALS

In addition to the preceding, the District is providing additional, enclosed material as part of its comments and evidence, as follows.

We enclose documents completed by numerous individuals identified as testimony or comment (or both).[128] Owing to the limitations on time to respond to the Tentative Permit, the immediately preceding materials do not necessarily include all of the content of each of these individuals' testimony/comment. Accordingly, all of such material is incorporated by reference as part of the District's comments. The individuals' documents themselves also attach certain materials to which they refer. Documents and exhibits referred to specifically in the testimony of Drs. Engle and Gerba are contained on one CD, which is included with the materials submitted with these comments.

[128] The persons submitting written testimony include: Charles P. Gerba, Ph.D.; Michael D. Bryan, Ph.D.; Diana L. Engle, Ph.D.; Cameron A. Irvine, R.P.; Hugh Stephen McDonald; Denny S. Parker, Ph.D.; Susan C. Paulsen, Ph.D.; Claus Suverkroppll; and Robert Williams.

We also enclose three additional CDs containing sources referenced in the preceding sections and in prior submittals by the District to the Regional Board (such as District comments on the "issue papers" released by Regional Board staff and references cited in other prior District submittals).